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Commonwealth of Pennsylvania
DEPARTMENT OF PUBLIC INSTRUCTION

COURSES OF STUDY IN SCIENCE

GRADES ONE, TWO AND THREE

Bulletin 72

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FOREWORD

THE need for an articulated and coordinated course of study in science for the twelve grades of the public school system has long been recognized. It is a special pleasure, therefore, to announce the completion of such a course.

The course of study for the first six grades was prepared by Helen Purcell, Director of Elementary and Kindergarten Education. In the interest of economy this course has been divided into two parts: Bulletin 72 covers the work of grades one, two and three, and Bulletin 72A covers the work of grades four, five and six. The work for grades seven, eight and nine is included in a separate bulletin. A fourth publication covers the work for grades ten, eleven and twelve. These materials are part of a general program of curriculum reorganization developed under the general direction of William H. Bristow, Deputy Superintendent, Curriculum Bureau.

Valuable help in the preparation of this material was given by other departments of the State government, whose work includes scientific fields. This, we believe, is unique. The material also incorporates the best thought of representatives of other bureaus in the Department of Public Instruction, particularly the Vocational Bureau, in connection with this field.

This course of study was distributed in mimeographed form during the school year 1929. Teachers were asked to submit criticisms and suggestions. Many of these suggestions have been incorporated in the present course. Doctor George R. Green, Professor of Nature Study, Pennsylvania State College; Dr. E. E. Wildman, Director of Science, Philadelphia; and Mr. Arthur Clark, Supervisor of Science, Philadelphia, reviewed the material in detail and offered many constructive suggestions.

JAMES N. RULE
Superintendent of Public Instruction

May 1, 1932

COURSES OF STUDY IN SCIENCE FOR GRADES ONE, TWO AND THREE

SCIENCE AS A SCHOOL ACTIVITY

OUTCOMES of Science in Terms of Personal Assets.—Science, in common with all the subjects of study, should contribute to the preservation and development of desirable moral and civic qualities. These partly grow out of the life of the school as it is affected by the activities related to the subject, and partly through innate opportunities in the subject itself. Within its specific fields a study of science in the first six grades should center around familiar facts and phenomena. With these as a background it should seek to give the pupil the beginnings of scientific knowledge; to lay the foundations for future scientific growth; to develop the habit of seeking information at its source; to protect and expand the child's interest in nature; to point out the need for preservation and development of natural resources; to set up the beginnings of a sense of the importance of science in the life of the world; to fill the pupil with a desire for the truth and show him the need for proof; to give him the foundations for a scientific method of thinking.

Importance of Relevant Experiences.—A realization of the outcomes listed above implies that a study of science is a series of experiences in the expression of these outcomes. The suggested activities included in each unit are an attempt to help the teacher in the organization of such experiences. It is not intended that these activities shall be carried out in their entirety or that they shall take the place of activities that in the judgment of the teacher are more suitable to the situation. They are intended only to point toward the type of method that should prevail, and to provide the teacher with help in organizing activities suited to her particular problem and environment. Knowledge obtained from books has a limited place in a study of science in the first six grades. Actual contacts with the materials involved should be sought. The pupil should be helped to find knowledge where it exists; to seek it from those who know; to make a study of science a concrete and active process.

Reference Material.—The large part taken in the preparation of this course of study by other departments in the organization of the Commonwealth has been mentioned in the Foreword. Much material in scientific fields has been prepared by these departments. This material was constantly used in the organization of the courses of study for the first six grades and is necessary to their best interpretation. These bulletins may be obtained by superintendents upon application to the departments publishing them. It will be necessary, however, to consider these bulletins as permanent reference material. The cost of publication is large and their distribution will necessarily be limited to reasonable numbers. Valuable bulletins respecting problems in science may be obtained at slight cost from the United States Government. Lists of such material may be obtained by addressing the Superintendent of Documents, Washington, D. C.*

A number of problems included in the course of study are not covered by the bulletins suggested above. Reference material relating to these problems is necessary to complete instruction. In addition, the teacher of science needs material at hand that will enable her to satisfy extensions of her curiosity, and to answer questions that may be raised by the pupils that the bulletins listed may not cover. A helpful list of such additional material is suggested. Where the title of the book or bulletin specifically indicates the material covered, it is listed following the course of study for the grade only. If material is needed that is not clearly indicated in the title, a detailed reference is inserted following the point to which it refers. So, too, information not generally obtainable is included in the text. All reference material with publishers is listed in the bibliography at the close of the course of study.

Visual Material and the School Journey.—The stereograph, the slide, and the moving picture are necessarily a part of a highly effective study of science. Suggestions for a minimum use of such materials toward which the school should work are included. Pictorial material and object-specimen materials are frequently suggested. Museums in the community or nearby should be capitalized to the fullest extent. All materials suggested for study may be seen clearly with the naked eye. The simple microscope and the field glass, however, are sources of great joy to the child. So, too, a compound microscope uncovers marvelous things. None of these, however, are necessary to the development of the course of study as organized. They are valuable supplemental helps only.

The school journey is frequently listed as a suggested activity. Such a suggestion may be carried out in several ways:

1. The entire class may make the visit during school hours or at some other period arranged by the teacher and the class.
2. Individuals or groups may make visits suggested outside of school hours if the point to be visited is within the immediate neighborhood and the children have reached an age that makes a safe journey probable.
3. Individuals who have opportunities for transportation may make visits and report the results of their observations to the class.

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* Such a list costs ten cents. Stamps are not accepted.

Additional information as to standards, equipment, and supplies in the fields of visual material and the school journey may be obtained by addressing the Director of Visual Education, Department of Public Instruction, Harrisburg.

Use of the Radio.—Where a school radio is available, arrangements should be made for the reception of talks that correlate with the course in science. Pupils should also be stimulated to "tune in" on relevant science talks that are given in the early evening. Such talks may be reported in class for the benefit of pupils who do not have radios and for purposes of general discussion.

Encouragement of the Pupil with Special Scientific Aptitudes.—The Edisons and Marconis of the future are now in our schools. To discover and encourage unusual talent is a specific obligation of the teacher. Individual projects should be encouraged, "Fad" exhibits planned and in every possible way special talent encouraged and developed.

Unifications and Correlations.—Each teacher should examine the units suggested for the grade for possible unifications or correlations with other units in science or with other subjects of study. Economy of time and effort should always be sought. A school journey suggested in connection with one unit not infrequently may be made to include material in another unit or may contribute to another subject of study. As pointed out, the course of study in science is suggestive only. The manner of its use is in the hands of supervisory officials and teachers.

Mastery of Essentials.—Care must be taken, throughout the course, to keep the material within the comprehension of the child. The organization of complicated material is beyond the capacities of the pupil in the first six grades. The course seeks primarily to give him simple scientific experiences within the limits of his environment and to stimulate his scientific interests. Facts required are limited. Additional facts to be mastered must be determined by supervisors and teachers. Communities differ in their scientific backgrounds. Supervisors and teachers differ in their opinions as to what is of primary importance. Decisions, however, should be made and results obtained.

Fitting the Course to the Community

Limitations of a State Course of Study.—An attempt has been made to correlate this course of study with the scientific resources and activities of the Commonwealth; to make these a center for the development of larger scientific interests and activities. A course of study prepared for a State as large as Pennsylvania, however, is unavoidably general in character. The backgrounds necessary for the development of some of the problems included may not exist in certain communities nor in nearby territory. On the other hand, scientific materials close at hand may be omitted. So, too, the apartment-house dweller is not likely to have space for a garden and must necessarily find his field of garden practice in window boxes and flower pots. The same principle holds true with respect to seasonal differences. Spring comes earlier in the Southern part of our State than in the Northern part; highlands and lowlands show similar differences. The course of study offered, therefore, is suggestive only of what may be done. The problem of fitting it to the materials and conditions of a specific community is the task of the officials and teachers of that community. This should be undertaken at once and carried to tentative completion as soon as possible.

Opportunity for Choice and Substitution.—Examples of specific community differences are found in the trees, bushes, vines, common to the locality; in the garden flowers generally cultivated and in the wild flowers with which the group may reasonably be expected to become acquainted through observation. The scope of the lists given in the Appendix exceeds the requirements of the course. Such substitutions, eliminations and additions should be made as are necessary to make these lists of maximum use.

Suggestions for Installing the Course

Need for Adjustments.—In introducing this course of study, teachers should remember that no class beyond the first grade will be prepared to take up the work as outlined; that the second grade will not have the backgrounds for this grade for another year; that it will take two years before the third grade is adequately prepared for the material outlined; three years for the fourth grade; four years for the fifth grade; five years for the sixth grade. In the meantime, adjustments necessarily must be made. Identifications should be reduced to reasonable proportions; material not necessarily related to the work of previous grades should be emphasized, or specific topics chosen and work suggested for preceding grades included. In short, adjustments must be made to fit the situation.

A New Adventure.—The teaching of science will be a new adventure for many teachers in the first six grades. It may be that some teachers will feel unprepared to carry on the work and will approach it with misgivings and timidity. No teacher should be worried. Rather teachers should learn with the children; enjoy with them the discovery of new wonders in nature's realms, the thrill of simple experiments that introduce vital principles, the immensity of modern scientific advances. The world today is a scientific world. The future promises to be still more scientific. He who lives fully today or tomorrow or within a more distant period must be part of such a world. Let us all learn together to capitalize the assets and enjoy the marvels that a scientific world possesses.

GRADE ONE

AUTUMN

I. ANIMALS
- A. Problems and Experiences
  1. To note where most animals live: open fields, trees, occasionally underground.
  2. To learn that there are domestic animals and wild animals.
  3. To identify the most common of such animals.
- B. Suggested Activities
  1. Pupils tell about animals with which they are acquainted; where they live; what they eat.
  2. Bring to school magazines or books containing pictures of domestic animals; of wild animals.
  3. Consider how domestic animals with which pupils are acquainted help man.
  4. Make trip to zoo if there is one in neighborhood.
  5. Discuss animals seen in the zoo with which pupils were not formerly acquainted.
  6. Teacher and pupils tell stories about the lion, tiger, and other menagerie animals.
  7. Pupils draw from memory on blackboard or paper a domestic animal that they know; a menagerie animal.

II. ANIMAL AND INSECT LIFE
- A. Problems and Experiences
  1. To discover some of the common and interesting types of animal and insect life in the neighborhood.
  2. To provide homes for some of these animal and insect types in the schoolroom.
  3. To take care of animals and insects thus established.
- B. Suggested Activities
  1. Make school journeys for purpose of discovering and observing common types of animal and insect life in neighborhood; to find pupae from which moths and butterflies hatch.
  2. Install in insect cages, animal cages, or aquariums, some such types found, as toad, fish, grasshopper, cricket, spider.
  3. Discuss colors of butterflies and other insects observed.
  4. Determine foods necessary for support of materials collected; other things necessary for health and comfort, as water, moisture, temperature.
  5. Place pupae gathered in classroom and watch for hatching.

NOTE: Teacher make sure that several pupae of the Monarch Butterfly are among those gathered.

III. FLOWERS
- A. Problems and Experiences
  1. To enjoy beautiful flower gardens in the community.
  2. To learn that flowers grow from seeds and bulbs.
  3. To learn to identify at least one garden flower blooming in Autumn.
- B. Suggested Activities
  1. Visit especially beautiful flower gardens in community.
  2. Pupils bring garden flowers to school for bouquets or other decorative purposes; consider use and arrangement so as to secure artistic effects.
  3. Each pupil learn name of at least one flower brought to school. Look particularly for one among those listed for Autumn, Grade I, Appendix.
  4. Pupils gather flower seeds; dry and plant some of seeds gathered that sprout quickly in pots or boxes. Note new plants.
  5. Plant in glass dish filled with pebbles and water such bulbs as the Paper White Narcissus, the Chinese Sacred Narcissus or Lily, the Roman Hyacinth. Care for these so as to assure blossoming at the Christmas season. (Meier, School and Home Gardens, Ginn and Company, 1913, gives information respecting the growing of bulbs in glasses.)

IV. FRUITS AND VEGETABLES
- A. Problems and Experiences
  1. To find Autumn vegetables and fruits in gardens and on trees.
  2. To observe manner of growth.
  3. To enjoy the use of fruits and vegetables in connection with the fun of Hallowe'en.
  4. To learn that fruits and vegetables may be dried or canned for Winter use.
- B. Suggested Activities
  1. Make school journeys in Autumn to see fruits still on trees; to see vegetables that have not been harvested.

NOTE: If arrangements are made with owners, perhaps samples of fruits and vegetables observed may be picked or pulled up.

  2. Pupils report experiences in which they have helped to gather fruits and vegetables; include manner of growth, as on trees, vines, underground.
  3. List fruits and vegetables that pupils are eating in their homes.
  4. List pupils whose parents raise vegetables in their home gardens; those who raise fruits.
  5. Model fruit and vegetable forms in clay. These may be colored with water colors.
  6. Pupils tell stories of what their mothers are doing in the way of preparing foods so that they will keep for Winter use.

7. Pupils prepare and string apples for drying. Pack and put away when dry.
8. Teacher and pupils prepare small jar of fruit or glass of jelly for Winter use.
9. Learn to identify most common fruits and vegetables.
10. Pupils make pictures of fruits and vegetables. Label each one. Make into booklets.
11. Decorate schoolroom at Hallowe'en with appropriate fruits, grains and vegetables.
12. Perhaps some of the fathers will make large Jack-o-lanterns and present them to the class.
13. With help of teacher, class make small Jack-o-lanterns and perhaps a large Jack-o-lantern.
14. Make dolls and animals of potatoes and toothpicks or other vegetables and materials.

V. HOUSEHOLD PETS

A. Problems and Experiences

1. To learn the names of common pets in homes of pupils.
2. To note the habits of these pets; food, sleep, attitudes toward the family and other people.

B. Suggested Activities

1. Pupils tell stories of animal pets in their homes; of their kindness to these pets; of indications of affection on the part of these pets; of specific activities.
2. Establish pet bird or other pet in classroom. Choose a name for this pet.
3. Pupils learn to take care of such pets.

NOTE: If pet is an animal be sure that suitable quarters and a warm sleeping box is provided. One way of providing such a home follows: Set a wooden box on one of its narrow sides with open side out; cover open side with wire netting; make door in one end; place warm sleeping box inside: A pan of ashes, sawdust or earth should be provided so that conditions may be sanitary.

4. Teacher tell stories of kindness to pets on part of children.
5. Pupils learn to identify common household pets by general names as birds, dogs, cats.

VI. SUN, WIND, RAIN, HAIL, CLOUDS, LIGHTNING

A. Problems and Experiences

1. To learn that the sun is the source of heat and light.
2. To make beginnings in relating directions to the sun.
3. To enjoy the fun of the wind.
4. To find from where rain and hail come.
5. To make lightning a background for the beginnings of scientific thought.

B. Suggested Activities

1. Pupils and teacher discuss relation of sun to heat; to day; to night.
2. Pupils point to sun in morning; at noon; in late afternoon; repeat this many times, at first every day, and then at gradually longer intervals during the year.
3. Determine why the day is darker if the sky is covered with clouds.
4. Pupils tell stories about things the wind does.
5. Pupils help the wind sing its song.
6. Note that rain and hail come from the sky.
7. Discuss appearance of sky during a storm.
8. Make pictures illustrating windy and stormy Autumn days.
9. Count number of seconds between flash of lightning and thunder. Determine in this way whether lightning clouds are near to earth, far from earth, very far from earth.

NOTE: Care should be taken to prevent the child from setting up a fear of lightning or thunder. Natural phenomena should be made beautiful and interesting to the child.

VII. TREES

A. Problems and Experiences

1. To enjoy the beauty of the Autumn colorings.
2. To note changes in trees as weather grows colder.

B. Suggested Activities

1. Class choose a "tree friend"; learn name of this friend.
2. Make picture of this friend illustrating changes in appearance as weather grows colder.
3. Make school journeys to see especially beautiful trees while the leaves are green; when clothed in Autumn colorings.
4. Pupils collect especially beautiful Autumn leaves.
5. Pupils walk through leaves that have fallen to the ground and note the song they sing.
6. Pupils help leaves to sing this song.
7. Pupils give an Autumn party. Invite parents and friends. Make Autumn leaf chaplets; foundations may be made of cardboard and Autumn leaves pinned to this.

Helps For The Teacher In Evaluating Progress

1. Did the animal and insect nests established in the schoolroom stimulate observation of such materials?

2. What evidence have you that the group is interested in finding out facts through observation? That they feel the beauty of the Autumn? of flowers? of foliage? That they are interested in their "tree friend?"

3. List the facts that your pupils should know as a result of the Autumn study of science. Test each pupil on these facts. Help pupils who are weak in any of these facts to learn them. Are there some pupils in the group who do not seem to be able to learn these facts? Have you sought to discover the reasons for this?

4. Are you satisfied with the growth of the bulbs planted in water? Did you secure blossoms for the Christmas season?

5. Has a study of science been accompanied by practice in desirable behavior on the part of the group? Have the pupils in the class practiced attention to the business on hand? Consideration for the rights of others? Obedience to the teacher's directions? Apply these questions to the school journey.

6. Have you remembered that the children in your group are very young and inexperienced and that they need much help and stimulation?

7. What worthwhile character values resulted to the children from your treatment of the wind? Through their care of pets kept in the schoolroom?

WINTER

I. Insects

A. Problems and Experiences

1. To determine why butterflies and moths do not fly about in the open during the Winter.
2. To watch for changes in pupae in schoolroom.

B. Suggested Activities

1. Discuss reasons for absence of butterflies during the Winter season.
2. Identify Monarch Butterfly among butterflies and moths that hatch in schoolroom.
3. If pupae hatch in schoolroom before butterflies or moths are found in the open, pupils discuss reasons for this.

Note: Pupils in the first grade will not discriminate between moths and butterflies. Both will be called butterflies. Answer questions raised but do not attempt any organized work on discrimination between butterflies and moths before the III Grade.

II. Fruits and Vegetables

A. Problems and Experiences

1. To extend knowledge of fruits and vegetables . acquired during the Autumn season.
2. To find additional sources of interests in fruits and vegetables.

B. Suggested Activities

1. Visit market or store where fruits and vegetables are sold and note fresh fruits and vegetables in addition to those grown in community or nearby neighborhood.
2. Pupils identify lemons, oranges, bananas.
3. Pupils learn from where dealers obtain fresh lettuce in the Winter.
4. Cut vegetables, fruits and berries in various ways and find the interesting things they show; such as the star and blossom inside the apple; onion rings; the rings in carrots and beets; the star that a cranberry shows when cut across.
5. Pupils wash carefully and cook and eat apples dried in Autumn. Add sugar and serve with small pieces of bread or with crackers, gingersnaps or other cakes.
6. Serve crackers with jelly or preserved fruit prepared in Autumn.

III. Milk, Eggs, Butter, Cheese

A. Problems and Experiences

1. To find that milk is obtained from the cow; that eggs are obtained from the hen.

B. Suggested Activities

1. Pupils trace milk used in their homes to the cow as its source; trace eggs to the hen as the source for eggs.
2. Pupils who have gathered eggs tell how this is done.
3. Pupils who have seen a cow milked tell about this.
4. If school is in an urban neighborhood, perhaps arrangements may be made so that pupils who have not seen a cow milked or have not gathered eggs from the nests may have both these experiences.
5. Collect cream from quart of milk. Make butter by beating with fork or egg beater. Wash, salt, and sample.
6. Teacher call attention to the fact that cheese, too, is made of milk. If children are not acquainted with cheese a grocer may be found who will give each pupil a tiny taste if a school journey to his store is arranged with him.
7. Make school journey to butter or cheese dairy if there is one in neighborhood that is conveniently near to school.

IV. Moon and Stars

A. Problems and Experiences

1. To note that the moon and stars light the night.
2. To enjoy the moon and stars.
3. To find the Big Dipper.
4. To watch for the new moon.

B. Suggested Activities

1. Note darkness on a cloudy, moonless night; on a star light, moonless night.
2. Watch for new moon; observe new moon grow larger. Note increasing light with increase in size of moon.
3. Make picture illustrating moonlight night.
4. Find the Big Dipper.
5. Cut stars and paste Big Dipper on paper or cardboard. Hang on wall nearest to direction in which Big Dipper appears in the sky.
6. Pupils prove truth of the Big Dipper that they have made by comparison with Dipper on first clear night following.
7. Teacher read or tell myth of Big Dipper, Ursa Major.
8. Pupils or teacher read or recite poems about the moon and the stars.
9. Pupils repeat happy experiences in which they enjoyed the moon and stars.

V. Plants and Flowers

A. Problems and Experiences

1. To help care for plants in the home and school.
2. To learn to identify one Winter house plant.
3. To consider success of bulbs planted for Christmas blossoming.

B. Suggested Activities

1. Note results in case of bulbs planted for Christmas blossoming. If successful determine reasons for this. If unsuccessful discuss reasons for this and how these shortcomings may be avoided.
2. Pupils report house plants in their homes; how they are cared for.
3. Identify one house or greenhouse flower or plant. Look especially for one among those listed for Winter, Grade I, Appendix.
4. Install hardy Winter plants in schoolroom if they can be kept from freezing. If freezing is probable, remove from room as cold weather approaches.

VI. Sun, Wind, Hail, Snow, Ice, Clouds

A. Problems and Experiences

1. To continue Autumn problems and experiences relating to sun, wind, hail, clouds.

2. To begin to definitize the directions East, West.
3. To continue to enjoy the fun of the wind.
4. To enjoy the beauty and fun of snow and ice.
5. To learn from where snow comes.
6. To learn how ice is formed.

B. Suggested Activities

1. Pupils continue to note appearance of sky when it snows, rains, or hails.
2. Make pictures illustrating typical Winter days.
3. Pupils learn that the direction in which they point to the sun in the early morning is called East; in the late afternoon West.
4. Pupils watch freezing of streams and ponds.
5. Note colors of ice.
6. Pupils watch hail and snow as it falls. Examine hailstones. When snowflakes are large catch some flakes on piece of dark cloth. Note that flakes differ in form.
7. Pupils build snow man.
8. On a very cold day pupils place two or three pans of water on outer window sill or other convenient place and watch freezing process. Use one pan for experimentation. Pupils stir freezing water in this pan occasionally and note how it thickens.
9. Pupils show their parents how water freezes.
10. Pupils tell stories of the fun they have on the ice.
11. Pupils help wind to sing its Winter song.
12. Pupils watch behavior of bits of paper, a feather, and other materials when the wind blows.

VII. TRANSPORTATION

A. Problems and Experiences

1. To find principal methods for getting from one place to another; how food and other things are brought to us.

B. Suggested Activities

1. List various ways in which children in class get from one place to another within the community.
2. List various types of vehicles that bring food and other things to homes in the community.
3. List ways in which people who go a long way travel.
4. Children tell stories of some trips they have made.
5. Pupils build common vehicles for transportation of blocks or other materials.
   Desirable: Stereographs on transportation, see pp. 57-66, Catalog 28, Keystone View Company, Meadville, Pennsylvania.

VIII. TREES, VINES, FLOWERS, ANIMALS, FOWLS

A. Problems and Experiences

1. To continue observation of "tree friend" chosen in Autumn.
2. To note the changes that take place in trees in the Winter.
3. To learn the names of common animals and fowls connected with Christmas season.
4. To enjoy trees, flowers, and vines connected with Christmas season.

B. Suggested Activities

1. Make picture of "tree friend" in Winter.
2. Pupils find trees and vines growing in community or nearby that are green at the Christmas season.
3. Teacher and parents give children a Christmas party. Each pupil paint a Christmas flower, tree, or animal for a present to another pupil.
4. Pupils discuss reasons for choosing evergreens for Christmas trees and wreaths.
5. Make trips to see evergreen trees if any grow nearby; to florists or greenhouses to see Christmas flowers in bloom.
6. Find trees growing in community that resemble Christmas trees.
7. Note how such trees differ from most other trees.
8. Learn to identify the Poinsettia.
9. Bring to school for examination pictures of Santa Claus and his reindeer; other pictures illustrating animals connected with the Christmas season.
10. Make pictures of reindeer and other animals connected with the Christmas season.
11. Make paper Poinsettias or other appropriate flowers for Christmas decorations.
12. Prepare Christmas tree for Christmas party.
13. Use as part of room decorations pictures or cutouts of reindeer and other suitable animals connected with the season.
14. Learn to identify fowls especially connected with the Christmas season, as turkey, chickens.

Helps For The Teacher In Evaluating Progress

1. Are the pupils giving satisfactory attention to the care of materials in the cages and aquariums?

2. What evidence do you have that the pupils in the class are beginning to feel the beauty of the stars and moon? The relation of the sun to heat and light? The dependence of man upon animal and vegetable life?

3. On windy days are pupils careful to close doors quietly?

4. Are you satisfied with care children are exercising in avoiding accidents when playing on the ice or in coasting?

5. Note the facts that you have thus far expected your pupils to learn. Do they know these facts? Remove any weaknesses that exist.

6. When pupils visited stores or other places to observe material did they thank the proprietor or his representative before leaving? Was a note of thanks sent to the proper person after such a visit?

7. Do all pupils in the group wash their hands before handling foods?

8. Were hygienic measures observed in preparing and eating the dried apples?

SPRING AND SUMMER

I. ANIMALS AND FISH

A. Problems and Experiences

1. To observe squirrels and rabbits in the open.
2. To find how the mother horse and the cow care for their young.
3. To note how fish swim.
4. To master identification of principal menagerie animals.

B. Suggested Activities
    1. Pupils establish gold fish or other fish in schoolroom.
    2. Note how the gold fish swims.
    3. Pupils who can do this establish gold fish in their homes.
    4. Pupils tell stories of squirrels and rabbits that they have seen in open.
    5. Make school journey to observe these animals if they may be found within convenient distance of the school.
    6. Pupils tell stories of calves and colts that they have known; of the mother's care for these.
    7. Pupils tell stories of menagerie animals that they have seen at circuses or other places.
    8. Pupils build a circus or menagerie of blocks or other materials.
    9. Make animals of clay or paper and install in cages or other appropriate place in circus.
    10. Label each animal cage and groups of animals outside of cages.

II. Birds
  A. Problems and Experiences
    1. To observe birds building their nests, and hatching their young.
    2. To note care of young birds by their parents.
    3. To learn to identify at least one bird.
    4. To learn to recognize the call or song of at least one bird.
  B. Suggested Activities
    1. Observe the building of a bird's nest. If one is being built near the school all may watch it. Otherwise pupils note where nests are being built and make such observations as they can without alarming the birds.
    2. Observe young birds. Note feeding and general care. Try to find out what the parents feed the young birds.
    3. Watch young birds learning to fly.
    4. Pupils listen to calls and songs of birds. Learn to recognize the call or song of at least one bird.
    5. Pupils plan to observe birds during the Summer.
    6. Pupils and teacher tell stories of birds.
    7. Identify Robin and watch his method of securing food.
    8. Correlate unit with a Bird Day Program.

III. Insects
  A. Problems and Experiences
    1. To observe butterflies and other insects.
    2. To identify the Monarch Butterfly.
  B. Suggested Activities
    1. Pupils make trips for purpose of finding and observing interesting insects, including butterflies.
    2. Find Monarch Butterfly.
    3. Make pictures of other butterflies.

IV. Farm
  A. Problems and Experiences
    1. To note what is being done on the farm.
    2. To follow activities on the farm as Spring and Summer advances.
  B. Suggested Activities
    1. Pupils who have been on farms report activities they have observed.
    2. Pupils make miniature farm on sandtable or in a box, or in corner of room.
    3. Make farm buildings and equipment; farm animals; farmer and his family.
    4. Make activities on this farm parallel activities on actual farm as they develop.
    5. Upon invitation, pupils who have no chickens in their homes visit pupils with chickens and observe gathering of eggs.
    6. Upon invitation of parents, children help to prepare the nest and eggs in one or two homes of children in the class where chickens are kept, if there are any such.
    7. Pupils make a second visit to see the hen sitting on the eggs; a third visit after the chicks are hatched.
    8. If the teacher considers it advisable, pupils may set a hen in the classroom or some other safe place within the school grounds.
    9. Note whether or not the mother hen takes good care of the eggs and chicks.
    10. Make picture of mother hen and chicks.

V. Flowers
  A. Problems and Experiences
    1. To learn to identify at least one common wild flower and one garden flower that grow in the community.
  B. Suggested Activities
    1. Learn to identify at least one common wild flower growing in community. Look particularly for one among those listed for Spring and Summer, Grade I, Appendix.
    2. Make pictures of spaces covered with dandelions.
    3. Identify one garden flower. Look especially for one among those listed for Spring and Summer, Grade I, Appendix.
    4. Decorate classroom with flowers for May Day.

VI. Flowers, Animals, Chicks
  A. Problems and Experiences
    1. To connect the Easter Lily, the rabbit and the chick with Easter holiday.
    2. To learn to care for a pet rabbit and young chickens.
  B. Suggested Activities
    1. Pupils visit greenhouses, florists, or stores to see Easter flowers.
    2. Note the Easter Lily.
    3. Observe use of rabbit in connection with Easter.
    4. If young chicks are commonly on sale in the stores, class adopt two or three of these.
    5. Arrangements may also be made for the class adoption of one or two rabbits.
    6. Each pupil make picture of rabbit, chicks, or Easter flowers as an Easter present to another pupil.

Note: Comfortable quarters must always be provided for pets and arrangements made for their care over week-ends.

VII. Foods

- A. Problems and Experiences
  1. To learn names of common fruits and berries that grow in the neighborhood that are available in the Spring and Summer.
- B. Suggested Activities
  1. List common fruits and berries that grow in neighborhood that pupils are using in their homes.
  2. Bring to school branches or pieces of vines on which these grow.

VIII. Growth of Plants From Seeds

- A. Problems and Experiences
  1. To learn that vegetables grow from seeds.
  2. To learn that flowers grow from seeds.
  3. To help in the planting of flower and vegetable seeds and in the care of the plants.
  4. To enjoy beautiful or thrifty flower and vegetable gardens in the neighborhood.
- B. Suggested Activities
  1. Pupils report what is being done at their homes in the preparation of flower gardens; ways in which they help in their home flower gardens.
  2. Make school journeys to see especially thrifty or beautiful flower and vegetable gardens.
  3. Plant lettuce seeds in window boxes.
  4. Thin out plants when three or four inches high and give to pupils to carry to their homes to transplant.
  5. Transplant lettuce plants to school garden plot or plant seeds in this plot, if lettuce may be gathered before close of school or care taken of it until it becomes usable.
  6. Before close of school use plants remaining in window boxes and those that are usable that may have been grown in school gardens for sandwiches or salad.
  7. Plant dwarf Nasturtium seeds in window boxes. Transplant as in case of lettuce plants. If plants retained in window boxes do not blossom by the time school closes give plants to pupils to take to their homes.
  8. Note roots when lettuce and Nasturitum plants are taken out of soil. Determine how the root helps the plant to grow.

IX. Sun, Wind, Rain, Hail, Clouds, The Rainbow

- A. Problems and Experiences
  1. To continue consideration of from where rain and hail come; effect on temperature and light when clouds come between sun and earth; observation of sun as source of heat and light; enjoyment of the fun that wind brings.
  2. To enjoy the rainbow.
  3. To add the directions North, South to the directions East, West.
- B. Suggested Activities
  1. Pupils help wind to sing its Spring and Summer song.
  2. Note clean appearance of streets, buildings, trees and plants following rain. Discuss reasons for this.
  3. Pupils tell stories of the fun that they have had on rainy days.
  4. Note disappearance and reappearance of sun in showery weather.
  5. Examine particles of ice if it should hail.
  6. Determine where sun is when it is cloudy during the day time.
  7. Pupils continue to point to sun in morning; at noon; in late afternoon; as directed in Autumn and Winter.
  8. Two pupils form compass with arms; one pupil extend right arm toward the East, left arm toward the West; other pupil extend arms over or under shoulders of another pupil so that right hand points toward the North and left hand points toward the South.
  9. Pupils continue practice during Spring and Summer until the directions East, West, North, South, are fixed.
  10. Pupils note rainbow when one appears in the sky; paint a picture of the rainbow; compare pictures with succeeding rainbows.

X. Trees

- A. Problems and Experiences
  1. To note changes in forest and shade trees as Spring advances.
  2. To note flowers on such trees.
  3. To note changes in fruit trees with the coming of Spring.
  4. To decide the relationship of flowers on trees to the nut and other forms of tree seeds.
  5. To identify one fruit tree.
- B. Suggested Activities
  1. Place branches of Pussy Willow or other trees in water and observe growth of leaves and flowers.
  2. Continue special observation of "tree friend."
  3. Learn to recognize flowers of one fruit tree common to the neighborhood. Look particularly for the flowers of the Peach tree.
  4. Each pupil make a picture of a fruit tree in blossom. Label picture with name of tree.
  5. Pupils and teacher read verses or prose about trees in the Spring.
  6. Pupils and teacher working together compose a verse or story about trees in the Spring.
  7. Make the study of trees a part of an Arbor Day Program.

Helps For The Teacher In Evaluating Progress

1. Do you feel that the aims set up for Spring and Summer have been realized? That the various aims set up for the year have been realized?
2. Has your work with respect to the care of pets reached the parents of the group?
3. Have the pupils a sense of the growth of trees, shrubs, flowers, and vegetables?
4. What evidence do you have that their appreciation of the beauty of flowers has been stimulated? That they enjoy watching the activities of birds?
5. Has your study of moths and butterflies been a successful one?
6. Do your pupils enjoy the beauty of the larvae of the Monarch Butterfly?
7. List the most important facts in science that you have attempted to teach during the year.

8. Find the points that each pupil knows. Make each pupil feel happy because of his knowledge. Help each pupil to learn the points that he does not know. Add to his happiness whenever he overcomes a difficulty.

9. Examine the work in nature study and science for Grade II. Is your class ready to take up this work?

10. List the character attributes in which you feel the work in science has given opportunity for special practice.

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GRADE TWO

AUTUMN

I. FLOWERS, FRUITS, VEGETABLES

- A. Problems and Experiences
  - 1. To enjoy the beauty of Autumn flowers, fruits and vegetables.
  - 2. To note difference in size and color of same kinds of flowers, fruits and vegetables.
  - 3. To plant bulbs and corms for Winter and Spring blossoming.
  - 4. To extend identification of flowers.
  - 5. To extend identification of fruits and vegetables.
- B. Suggested Activities
  - 1. Note different colors and sizes among Asters and other groups of flowers; among fruits and vegetables of same kinds.
  - 2. Identify three garden flowers. Look especially for flowers among those listed for Autumn, Grades I-II, Appendix.
  - 3. Identify one Autumn wild flower. Look especially for one among those listed for Autumn, Grade II, Appendix.
  - 4. In late October or early November pupils plant in glass dish filled with pebbles, Paper White Narcissus or other bulbs that thrive when planted in this way, as in Grade I. Pupils who can do this make such plantings at their homes.
  - 5. Plan to secure blossoms at Christmas time. (See Grade I, Autumn, Flowers)
  - 6. When plants blossom in homes pupils bring plants to school or place dish in window of home so that other pupils may see blossoms.
  - 7. In October or November plant Crocus corms in pots or window box for school blossoming. Place outdoors in safe place or keep indoors in cold place; bring into schoolroom in early Spring and note blossoming.
  - 8. If this can be arranged, pupils plant Crocus corms in school lawn.
  - 9. Pupils who can do this plant Crocus corms in home lawns.

II. ANIMALS

- A. Problems and Experiences
  - 1. To find what the rabbit, squirrel and deer eat in the Autumn; where they live; where they sleep.
- B. Suggested Activities
  - 1. Observe the foods and general habits of such of these animals as are commonly found in neighborhood.
  - 2. Inquire of people who may know as to food and habits of such of these animals as cannot be sufficiently observed.
  - 3. Pupils who keep any of these animals as pets report foods provided for them. If any of these animals were kept in schoolroom in Grade I, pupils report foods and other care given to them.

III. WINDS

- A. Problems and Experiences
  - 1. To learn that wind is air that is moving rapidly.
  - 2. To learn that some winds are cool or cold and that some winds are warm.
  - 3. To enjoy the fun of a windy day.
  - 4. To note directions from which cold winds come.
- B. Suggested Activities
  - 1. Pupils make wind by fanning or other means.
  - 2. Determine why a strong wind is felt when an automobile or a train passes quickly.
  - 3. Note various objects as trees and flag and determine whether there is no wind, a light wind, or a strong wind.
  - 4. When wind is blowing note whether it is cool, cold, or warm.
  - 5. Note direction from which warm winds come; cool and cold winds.

NOTE: If winds come from points between North and East, North and West, South and East, South and West, the directions may be given in terms of North-East, North-West, South-East, South-West.

  - 6. Determine why special care needs to be exercised in closing a door when the wind is blowing hard; why airplanes cannot safely fly in a high wind.

IV. SEASONS

- A. Problems and Experiences
  - 1. To enjoy the beauty of the Autumn season.
  - 2. To note that the weather grows colder as Autumn advances; that outdoor flowers disappear; that the leaves fall; that rains and winds grow colder; that the days grow shorter.
  - 3. To note last day of Autumn months.
- B. Suggested Activities
  - 1. Make school journeys for purpose of noting and enjoying situations typical of the Autumn season; early Autumn; middle Autumn; late Autumn.
  - 2. Make pictures typical of Autumn when the leaves have taken on their fall colorings; when the trees are bare. Compare these pictures with the Summer time.
  - 3. Examine magazines and books showing pictures of Autumn scenes and activities.
  - 4. Pupils tell experiences that indicate that the days are growing shorter; that the sun is ris-

ing later and setting earlier; that the winds are growing colder; that rains are growing colder.
5. Note last day of Autumn months.

V. BIRDS

A. Problems and Experiences
1. To extend identification of birds.
2. To note birds passing through community on way to Southland.

B. Suggested Activities
1. Identify three birds observed in community in Autumn. Look particularly for birds among those listed for Grades I-II, Appendix.
2. Note Autumn foods of birds identified.
3. Try to find abandoned nest of at least one specie of bird. Find specie of bird that built this nest.
4. Make school journeys to note migratory birds.
5. Find names of most common or interesting migratory birds observed.
6. Class choose for special study one migratory bird observed in neighborhood. Learn where this bird builds its nest; where it spends the Winter, and other interesting facts.
7. Make picture of bird chosen.
8. Class be on lookout for return of this bird in Spring.

VI. TREES

A. Problems and Experiences
1. To learn in what ways wood is useful.
2. To extend identification of trees.

B. Suggested Activities
1. Note effect upon beauty and growth of tree, chosen in Grade I, of plenty of room and sunshine.
2. List places in which wood has been used in the classroom; in the school building; in the home.
3. Identify in Autumn dress one tree, exclusive of fruit trees, found in community. Look especially for a tree among those listed for Grade II, Appendix.
4. Identify two fruit trees as they appear in the Autumn. Look especially for Peach and Apple trees.
5. Correlate with Autumn Arbor Day.

VII. INSECTS

A. Problems and Experiences
1. To learn to identify the Monarch Butterfly.
2. To learn to identify larvae of Monarch Butterfly.
3. To learn to identify chrysalis of Monarch Butterfly.

B. Suggested Activities
1. Make school journeys to observe butterflies. Find Monarch Butterflies. Find larva of Monarch Butterfly. (Found on milkweed. Commonly called milkweed caterpillar).
2. Make picture of Monarch Butterfly caterpillar; of Monarch Butterfly.
3. Find chrysalis of Monarch Butterfly. Enclose with netting or gauze so butterfly cannot escape when hatched. Watch for hatching in Spring. Take off net or gauze and watch butterfly go away.
4. Note beauty of colors and grace of movements of butterflies.
5. Gather pupae of butterflies and moths to hang in classroom as in Grade I.

VIII. SUN

A. Problems and Experiences
1. To review directions learned in Grade I.
2. To note relation of sun to shortening of days.
3. To note relation of sun to day and night.

B. Suggested Activities
1. Draw arrows on floor pointing toward East, West, North, South.
2. Discuss building or community landmarks that are East of the school; West; North; South.
3. Pupil note that sun rises later in the morning; that sun grows nearer to disappearance when they go home from school in evening; that it becomes dark when light of sun disappears; that daylight comes with the light from the sun; that it becomes necessary to have artificial light for evening meal; for breakfast for people who must go to work early.
4. Decide why people especially sleep at night and stay awake in the daytime.

IX. TIME

A. Problems and Experiences
1. To set up the beginnings of a sense of the meaning of second, minute, hour, day.

B. Suggested Activities
1. With cardboard or other material make hour glass. Experiment until sand moves from one compartment to the other in one hour. Correlate with time on clock.
2. Mark line inside hour glass at end of first fifteen minutes; at end of thirty minutes; at end of forty-five minutes. Pupils learn that fifteen minutes is frequently called one-quarter hour; thirty minutes, one half hour.
3. Note revolutions of minute hand in watch. Count seconds in minute as hand moves along.
4. Pupils find number of hours they are in school; length of noon period; recesses; length of day and night together.

X. ROCKS, STONES

A. Problems and Experiences
1. To enjoy the beauty of stones in neighborhood.
2. To begin the collection of stones.

B. Suggested Activities
1. Each pupil collect five or six small stones found in neighborhood. If stones may not be found in neighborhood pupils collect stones when in neighborhoods in which they occur, or gather them through other means.
2. Each pupil arrange stones in box labeled with his name.
3. Organize exhibition of stones. Invite First Grade.

4. Each pupil tell where he found the stone in his exhibit that he likes best and any other facts relating to his collection that he may consider interesting.

Helps For The Teacher In Evaluating Progress

1. Were pupils interested in the exhibit of fruits, vegetables and flowers?
2. Have the pupils in the class a concept of the sun as setting earlier each evening; as rising later each morning; of the approach of Winter with the shortening of the days; of reasons why people prefer to work during the day and sleep during the night?
3. What indications have you seen of a constantly growing appreciation of the beauty of trees?
4. Have the pupils in the class made acceptable progress in their study of time?
5. Are pupils interested in the collection of stones?
6. Test pupils on identification of birds, flowers, trees and insects as outlined for Autumn
7. Has the study of science contributed to the development of a respect for the rights of others?
8. Review the outstanding disciplinary situations that have arisen in the study of science. Do you feel that your treatment of these situations stimulated improvement?

WINTER

I. SEASONS

A. Problems and Experiences

1. To enjoy the beauties of Winter.
2. To note the falling of snow; forming of ice; that most trees and bushes are bare.
3. To continue Autumn observation of shortening of days.
4. To note lengthening of days as Winter advances.
5. To note last day of Winter months.

B. Suggested Activities

1. Make school journeys for purpose of noting situations typical of the Winter season; for example, bare trees, absence of flowers, snow on ground, ice on streams.
2. Cut out square or oblong from center of sheet of paper. Imagine surrounding paper is a frame. Adjust so as to obtain an especially beautiful Winter scene. Paint this scene.
3. Examine magazines and books showing pictures of Winter activities.
4. Note shortest day of year.
5. Note gradual lengthening of days following this.
6. Pupils relate experiences that show that days are growing longer, that sun is rising earlier in the morning and setting later at night.
7. Note last day of Winter months.

II. SUN, MOON, STARS

A. Problems and Experiences

1. To think about the bigness of space.
2. To find the Milky Way.

B. Suggested Activities

1. Discuss great distance of sun, moon and stars from earth; that even if we could fly to them it would take the swiftest airplane a hundred years to reach the moon; and that the sun and stars are many, many times farther away.
2. Find the Milky Way.
3. Discuss reasons for dim appearance of these stars. (Extreme distance from earth.)
4. Read or tell myth of Milky Way.

III. PEOPLE, BIRDS, ANIMALS

A. Problems and Experiences

1. To determine some ways in which people, birds, and animals keep warm in Winter.

B. Suggested Activities

1. Determine why people wear heavier clothing in cold weather than in warm weather; why houses are heated in cold weather; why the hair or fur of animals becomes heavier as Winter approaches; why birds fluff out their feathers in cold weather; why certain animals and reptiles sleep all winter, as bears, frogs, toads, snakes. (Gerald Craig, Tentative Course of Study in Elementary Science for Grades I and II, pp. 41, 67)
2. Determine season of year when loose cat hairs and loose dog hairs are most numerous; why hairs are shed at this season.
3. Pupils paint Winter scenes that include people, animals or birds.
4. List names of hibernating animals that pupils and teacher know.
5. Compose composite dramatization of not more than twenty or thirty lines around the theme of hibernation, teacher and pupils working together.
6. Note birds that remain in community during Winter. Identify at least one of these birds.
7. Note foods Winter birds eat; where they sleep; how they protect themselves from the cold.

IV. WINDS

A. Problems and Experiences

1. To note direction from which winds come when it is very cold.
2. To note direction from which snowstorms come.
3. To note differences in velocity of wind.

B. Suggested Activities

1. Note days when wind is high; very high.
2. Make pictures that indicate a high wind.
3. Note direction from which cold winds come; from which snow storms come. Keep record of these on blackboard or chart.
4. Examine this record at close of Winter and determine prevailing direction from which cold winds come; from which snowstorms come.

V. TIME

A. Problems and Experiences

1. To continue a study of time as set up for the Autumn.
2. To learn to tell the hours on the clock; the place of the hands at the quarter or fifteen minute place after the hour; the half or thirty minute place after the hour; the quarter or

fifteen minute place before the hour; the half or thirty minute place before the hour.
3. To master names of days in week.

B. Suggested Activities
1. Make clock face with Arabic numerals; place Roman numeral below each Arabic numeral. Attach hands of cardboard or other materials so that they are movable.
2. Learn to recognize hour marks on this clock face. Report kinds of numerals on clock faces in homes.
3. Count on clock or watch number of minutes that minute hand travels between each hour; seconds in minute.
4. Locate the fifteen minute or quarter hour after the hour place; the thirty minute or half hour after the hour place; the fifteen minute or quarter of the hour place. Each pupil practice with cardboard clock face until he has mastered time telling on these terms.
5. If there is a town clock or other clock that pupils hear strike, learn when it strikes and how many strokes each time. If, for example, a clock strikes every fifteen minutes or half hour, how these periods are indicated.
6. Pupils note name of each day in week and place name on blackboard over a period of four weeks. Master names of days in week. Review time telling taught in previous units. Check each day on calendar and repeat day of week.

VI. Animals

A. Problems and Experiences
1. To study the habits of three or four harmless wild animals in neighborhood.

B. Suggested Activities
1. Identify three or four common wild animals in neighborhood, if there are any such, as squirrel, rabbit, deer.
2. Discuss Winter habits of these animals; what they eat; how they get food; where they sleep.
3. Examine pictures of common wild animals, such as are found in community and nearby region.
4. Pupils tell stories illustrating personal experiences with harmless wild animals.
5. Teacher read or tell stories of these animals.
6. Pupils make sandtable scene showing common wild animals in neighborhood in typical situations.
7. Class adopt a rabbit, squirrel, or other harmless wild animal as a classroom pet. Provide home and care.

VII. Household Pets

A. Problems and Experiences
1. To learn how to care for a pet dog.
2. To determine why man likes the dog.

B. Suggested Activities
1. Pupils with dogs in their homes report this fact with name of dog.
2. Pupils tell how they care for these dogs.
3. Visit dog hospital or kennels if there are such in neighborhood.
4. Get advice from keeper of such a kennel or other person who knows how to take care of dogs, as to how to feed and care for a pet dog.
5. Pupils tell stories illustrating the affection and loyalty of their dogs; the joy of their companionship; other values that the dog has.
6. Each pupil who has a dog make a model of this dog in clay; other pupils model a neighbor's dog or other dog. Organize exhibit of this material.
7. Dictate composition on care of pet dogs, or of a particular type of pet; for example, what to feed goldfish and how to care for them. Teacher write material dictated on blackboard. If duplicating machine is available copies of this composition may be sent into the homes, thus further stimulating the care of pets. The local press will frequently publish material developed in the school that is of general interest. This is stimulating to both pupils and parents. These stories may also be correlated with reading.

VIII. Fowls

A. Problems and Experiences
1. To learn to identify turkey, goose, duck.
2. To learn how these fowls contribute to man's support and comfort.

B. Suggested Activities
1. Pupil discuss values to man of above fowls, as food, feathers for pillows and other uses.
2. Examine pictures of these fowls. Learn to identify them.

IX. Flowers

A. Problems and Experiences
1. To enjoy house and greenhouse flowers and plants.
2. To learn to identify a minimum of two house or greenhouse flowers or plants.

B. Suggested Activities
1. Pupils visit greenhouses or florists.
2. Pupils report desirable flowers and plants growing in their homes, if any, that they did not see in the greenhouse visited.
3. Identify two house or greenhouse plants. Look especially for two among those listed for Winter, Grades I-II, Appendix.

X. Science In The Home

A. Problems and Experiences
1. To find how most homes in the community are lighted.
2. To determine best sources for artificial light.

B. Suggested Activities
1. Consider different methods of lighting in the various homes.
2. Discuss other methods of lighting if any such have been observed by children or teacher.
3. Note how the stores with which pupils are acquainted are lighted; how streets are lighted.
4. Locate the nearest electric light plant; the nearest gas plant.

5. In connection with Washington's Birthday pupils find how he lighted his home; find how Lincoln secured light to read.
6. Discuss best types of artificial lighting.

XI. HEREDITY

A. Problems and Experiences

1. To note that there are different breeds of the same animals as cats, dogs.

B. Suggested Activities

1. Discuss the different breeds of dogs in the homes of different pupils.
2. Pupils bring books or magazines to school that contain pictures of different breeds of dogs.
3. Each pupil having a dog seek resemblances to pictures.
4. Carry out similar project for cats.
5. Learn to identify two or three most common breeds of dogs in community.

XII. VEGETABLES AND FRUITS

A. Problems and Experiences

1. To extend knowledge of fruits and vegetables available in neighborhood in Winter.

B. Suggested Activities

1. Pupils discuss fruits and vegetables being used in their homes; list those that grow in the neighborhood; find from where others come.
2. Make journey to market or to store where fruits and vegetables are sold.
3. Find from where dealer secures fresh fruits and vegetables for Winter trade.
4. Ask dealers in fruits and vegetables to make attractive window or other display on a day decided upon.
5. Pupils visit such displays.

XIII. INSECTS

A. Problems and Experiences

1. To observe butterflies and moths that hatch from pupae in schoolroom in late Winter or early Spring.
2. To decide if Monarch Butterfly is among these.

B. Suggested Activities

1. Note appearance of moths and butterflies that hatch from pupae gathered in the Autumn. Recall appearance of Monarch Butterfly.
2. Determine whether or not any butterflies hatched from these pupae are Monarch butterflies. If there is uncertainty, examine pictures of this butterfly or read description of its appearance.
3. Note type of pupae from which Monarch Butterflies hatch.

XIV. TREES, VINES

A. Problems and Experiences

1. To note trees growing in community or nearby that are similar to Christmas trees.
2. To extend identification of trees.
3. To learn names of trees and vines most commonly used for Christmas decorations.
4. To enjoy the beauty of Winter trees.

B. Suggested Activities

1. Pupils note appearance of "tree friend" chosen in Grade I. Find other trees of same species.
2. Note trees in neighborhood that are similar to Christmas trees.
3. Find names of plants most commonly used for Christmas wreaths.
4. Make pictures of Winter trees against the sky.
5. Pupils bring to school magazines or other materials containing beautiful Winter scenes that include trees.
6. Identify at least one tree found in community exclusive of fruit trees, as it appears in Winter. Look especially for one among those listed for Grade II, Appendix.
7. Identify two fruit trees as they appear in Winter. Look especially for Peach and Apple trees.

XV. FISH

A. Problems and Experiences

1. To find names of one or two kinds of fish most commonly used in community for food.
2. To learn some of the places where these fish live, as ocean, lake, river.

B. Suggested Activities

1. Pupils report kinds of fish being used for food in their homes.
2. Make trips to food stores for purpose of seeing fish sold for food.
3. Ask dealer to see a fish that lives in the ocean; one that lives in lakes; in rivers.

Helps For The Teacher In Evaluating Progress

1. Have pupils enjoyed the beauty of Winter? Its opportunities for sports?
2. Do pupils connect the lengthening of the days with earlier rising and later setting of the sun?
3. Are pupils interested in the stars?
4. What evidence do you have that the pupils in the class have grown in kindliness to animals as a result of emphasis upon their care.
5. Were pupils courteous in their visits to the florists and to other places? Did they express their thanks to the proprietors? Did they follow their visit with a note of thanks?
6. Is your collection of pupae a satisfactory one?
7. Do pupils have a genuine affection for their "tree friends"?
8. Place on blackboard true-false tests such as those given below, covering the material considered since the previous Helps for the Teacher in Evaluating Progress. Give and consider only a few points at a time. Instruct pupils as to marking true or false.
   a. The sun rises in the west.
   b. The new moon is large and round.
   c. Noon is usually the hottest part of the day.
   d. An airplane that came near to the sun would burn up.
   e. Cats and dogs shed most of their hair in the Autumn.
9. Make the test a happy exercise. Discuss results with pupils. Remove weaknesses disclosed.

SPRING AND SUMMER

I. FLOWERS, VEGETABLES, HOME AND SCHOOL GARDENS

A. Problems and Experiences

1. To extend identification of flowers and plants.
2. To plant flower seeds and vegetable seeds in school and home gardens.

3. To determine reasons for conservation of wild flowers.
4. To learn to identify a minimum of two wild flowers that grow in community or nearby.
5. To discover the relation between growth of plants and warmth.
6. To check on growth of Crocus corms planted in Autumn.
7. To learn the need for tested seeds.

B. Suggested Activities

1. Pupils organize exhibit of house plants brought from home.
2. Pupil place his name and name of plant on each pot. Invite First Grade or other Grades to see exhibit.
3. In late Winter or early Spring, plant on blotting paper in tumblers or other dishes, pumpkin, squash, and other seeds.
4. Note number of seeds of each kind planted.
5. Note number of seeds of each kind that sprout; number of plants that are particularly strong; that are weak.
6. Consider whether or not the propagation of each type of seed planted indicates that the package contains first class seeds.
7. In other tumblers or dishes plant on blotting paper several seeds that have been boiled; several seeds in which the germ end has been cut off. Note results.
8. Discuss relation of good seeds to good crops.
9. Test in similar way seeds that it is proposed to plant in gardens.
10. Teacher and class working together write description of experiment and conclusions reached. A local newspaper may take this.
11. Plant Sunflower seeds in home gardens. Discuss best location in which to plant these seeds. Plant in school garden also if space can be obtained.
12. Make school journeys to observe Tulip beds in parks or home gardens.
13. Make pictures of Tulips and Tulip beds.
14. Identify three garden flowers in the Spring and Summer. Look especially for flowers among those listed for Spring and Summer, Grades I-II, Appendix.
15. Make trips for the purpose of observing wild flowers in their native habitats, if such flowers grow within convenient distance of school.
16. Pupils describe wild flowers that they have seen on individual trips or visits to the country; pupils and teacher try to give names of flowers described.
17. Identify at least two wild flowers. Look especially for flowers among those listed for Spring and Summer, Grades I-II, Appendix.
18. Note wild flowers identified that should not be picked.
19. Discuss reasons why most wild flowers should not be picked.
20. Consider results of Crocus corms planted in the Autumn. If unsuccessful find reasons for this.
21. Plant beans or other seeds in pots or boxes. Place pots or boxes in different parts of room in relation to sunlight so that some pots or boxes will receive much sunshine, others less sunshine, and some no sunshine. Keep equally moist.
22. Determine relation of sunshine to growth of seeds.
23. Apply principle discovered to home gardens and lawns.
24. In late winter or very early spring plant Phlox seeds and Marigold seeds in pots or window boxes. Transplant to home and school gardens, retaining a few plants in boxes or pots in which they were planted.
25. Note progress of plants in schoolroom and in school gardens. Report progress in home gardens.
26. In late Winter or early Spring plant radish seeds in boxes in schoolroom and in homes and school gardens. (Root plants cannot be transplanted successfully.)
27. Report growth of radishes in home gardens.
28. Before close of school pupils harvest and eat tiny radishes.

Desirable: Stereographs of wild flowers. Send for list to Keystone View Company, Meadville, Pennsylvania.

II. RAINBOW

A. Problems and Experiences

1. To learn the colors in the rainbow.

B. Suggested Activities

1. Observe a rainbow.
2. If water and sprinkler are available, make an artificial rainbow.
3. Learn to name the colors in the rainbow.

III. HOW CLOTH IS DYED

A. Problems and Experiences

1. To make vegetable dyes.

B. Suggested Activities

1. Note flowers, berries, barks and other vegetable growths from which colors may be extracted.
2. Extract and strain colors.
3. Mix colors so as to secure still others.
4. Note effect when water is added.
5. Dye small pieces of cloth with each color developed.
6. Make sample book of colors obtained with these dyes, noting how dye used for sample was obtained.

IV. TRANSPORTATION

A. Problems and Experiences

1. To determine why the bicycle and tricycle move forward so rapidly.

B. Suggested Activities

1. Pupils examine tricycles and bicycles and determine how they cover the ground and why they move forward quickly.
2. Determine the same points with respect to wheels on other means of transportation.
3. Pupils bring to school magazines and books

containing pictures illustrating different types of bicycles that have been used in the past.
4. Compare efficiency and safety of early types of bicycles with those of today.

V. TREES, BUSHES, VINES

A. Problems and Experiences

1. To note changes in trees, bushes and vines in the Spring.
2. To extend identification of trees, bushes, vines.
3. To enjoy the beauty of trees, bushes and vines in the Spring.
4. To learn how roots help the plant to grow.
5. To learn how young trees are planted.

B. Suggested Activities

1. Note changes with the coming of Spring in "tree friend."
2. Place branches of trees in water and watch growth of buds and leaves.
3. Identify one flowering bush found in community.
4. Note English Ivy on church walls or houses.
5. Plant slips of Wandering Jew in water. Note growth. Examine roots. Determine use of roots.
6. Report especially beautiful shade or ornamental trees in neighborhood.
7. Make trip to see some of these trees.
8. Pupils whose parents plant trees in their yards ask parents to do this planting after school hours and to invite pupils in class so that they may observe such planting.
9. Identify one vine that flowers in the Spring or Summer.
10. Identify one tree in Spring and Summer dress. Look especially for one among those listed for Grade II, Appendix.
11. Identify two fruit trees in the Spring and Summer. Look especially for Peach and Apple trees.
12. Make picture of fruit trees in blossom.
13. Correlate with Spring Arbor Day.

VI. INSECTS AND ARACHNIDS

A. Problems and Experiences

1. To observe coloring of Spring insects.
2. To observe eggs and larvae of Monarch Butterfly.
3. To identify lightning bug.
4. To observe the "flash" of the lightning bug.
5. To observe activities of the spider.

B. Suggested Activities

1. Note insects and spiders whose colors are especially beautiful.
2. Find eggs and larvae of Monarch Butterfly (milkweed caterpillar). Note upon what plant these eggs are laid; what plant the larvae eats.
3. Place lightning bugs in bottles and observe flashes of light.
4. Note how the spider weaves his web; how he obtains food.

Desirable: Stereographs of insects. Send for list to Keystone View Company, Meadville, Pennsylvania.

VII. BIRDS

A. Problems and Experiences

1. To decide where most of the birds have been during the Winter; why they have returned.
2. To extend identification of birds.
3. To learn to identify one bird on basis of song or call.
4. To learn to identify the State bird, Ruffed Grouse.

B. Suggested Activities

1. Determine where most of the birds seen in the Spring have been during the Winter.
2. Make school journeys in which pupils listen to the birds and observe their activities.
3. Teacher read poems about birds to children.
4. Imitate song or call of at least one bird in neighborhood.
5. Identify three birds in Spring and Summer. Look especially for birds among those listed for Grades I-II, Appendix.
6. Pupils who are interested establish a pet Crow in their homes.
7. Discriminate between the term permanent and the term migratory as applied to birds.
8. Determine why the Crow and the Scarlet Tanager are called permanent residents.
9. Make a colored picture of the mother Tanager and the father Tanager, showing differences in coloring between mother and father.
10. Teacher and pupils organize alternative tests covering important points.
11. Examine pictures of the ruffed grouse.
12. Correlate study of unit with Bird Day Program.

VIII. TIME

A. Problems and Experiences

1. To master time-telling on a five minute basis.
2. To learn how to tell time on a basis of minute periods.

B. Suggested Activities

1. Learn to name the five minute periods in the clock face.
2. Practice time-telling until pupils can tell time on five minute basis.
3. Count the minute markings on the clock face and learn how these are used in time-telling.

IX. FISH

A. Problems and Experiences

1. To establish minnows in aquarium or glass jar.

B. Suggested Activities

1. Place minnows in aquarium if supply can be obtained. If minnows cannot be obtained perhaps a live fish of some other species may be secured and placed in water for observation.
2. Note how fish in aquarium swim; for what purpose they use their tails, their fins.
3. Find proper food to feed fish in aquarium; supply these foods.

X. VEGETABLES

- A. Problems and Experiences
  1. To learn names of common vegetables used for foods in the Spring.
  2. To find blossoms on vegetable plants.
- B. Suggested Activities
  1. Pupils list fresh vegetables being used for foods; vegetables that are still green or immature that will be used later.
  2. Each pupil learn to identify flower of at least one vegetable plant.

XI. EARTH AND MOON

- A. Problems and Experiences
  1. To learn that the earth and moon are like large balls and are lighted by the sun.
- B. Suggested Activities
  1. Darken room and concentrate rays of flash light or other light on globes or other balls that represent the earth and moon. Apply result to lighting of earth and moon by the sun.
  2. Discuss appearance of earth from the moon. Examine globe in connection with this.
  3. Locate Pennsylvania on this globe.

XII. ROCKS, STONES

- A. Problems and Experiences
  1. To continue to collect attractive stones.
- B. Suggested Activities
  1. Make trips to look for attractive stones.
  2. Pupils add at least one stone to collection of stones started in the Autumn.

XIII. SEASONS

- A. Problems and Experiences
  1. To note gradual coming of warmer weather in Spring; heat of Summer; planting in Spring; ripening and harvesting in Summer.
  2. To enjoy the Spring and Summer beauties and activities.
  3. To continue to note direction from which wind comes when it is warm; when it is cool.
  4. To master names of seasons.
- B. Suggested Activities
  1. Make school journeys for purpose of noting and enjoying situations typical of Spring and Summer; for example, Spring plowing and planting, blossoming of flowers.
  2. Pupils make pictures of sandtable scenes illustrating typical situations and conditions for Spring and Summer.
  3. Find pictures of these Spring and Summer activities. Bring to school for examination.
  4. Each day teacher or pupil write month, day of week, and date on space on blackboard kept for purpose or on chart.
  5. Pupils note ripening of seeds and gathering of harvests in Summer time.
  6. Pupils master names of seasons.

Helps For The Teacher In Evaluating Progress

1. Are your pupils interested in the planting and growth of seeds?

2. Do they have a sense of the relation of good seed and sufficient light to growth?

3. Do the home garden activities of the group indicate that their school work in planting and caring for flowers and vegetables has been truly successful?

4. Is each pupil able to identify the minimum number set up for flowers, vegetables, trees, insects, birds and other objects?

5. Were most of your pupils able to observe a pair of birds, building their nest and caring for their young?

6. Do your pupils have a sense of the earth and moon as large balls?

7. Can each pupil tell time within the limits set?

8. Do your pupils have a notion of the changes in weather in the various seasons.

9. To what extent have parents and others in the community invited the class to their tree planting: Were you pleased with the conduct of your pupils upon these occasions? Did the class write a note of acceptance in response to such an invitation? Did pupils thank the parents before leaving at the close of the planting?

10. What relation do you see between proper care of pets and character education?

11. Would "Helping the child to take proper care of his pets" be a good subject for a talk at a meeting of a parent-teacher association?

12. Do you think the pupils in your class have the beginnings of a sense of heredity?

13. Do you feel that the experiences of the pupils in class have given them practice in courteous conduct? In initiative? In consideration of the rights of others?

14. Organize a completion test covering ten outstanding items in the years work and place on blackboard. Discuss test with class and complete, all working together.

15. Examples of such a test follow:

The lion feeds on......................................
The following wild animals are nice pets: ....
....
These wild animals live in our neighborhood: ....
....

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GRADE THREE

AUTUMN

I. FLOWERS, FRUITS, VEGETABLES

A. Problems and Experiences

1. To report condition of flower and vegetable home gardens.
2. To learn names of common Autumn flowers, fruits and vegetables.
3. To learn how blooming plants may be grown in the house during the Winter.
4. To learn more about how fruits and vegetables are kept for Winter use.
5. To extend identification of flowers, fruits, vegetables.

B. Suggested Activities

1. Organize exhibition of Autumn flowers, fruits and vegetables; invite parents and friends.
2. Interview florist in neighborhood or people who are successful in raising Winter plants in order to secure advice as to what plants to choose and how to proceed so as to have (1) blooming plants in the house during Winter; (2) blossoming of plants at a specified time, as blossoming of certain plants at Christmas time.
3. Examine and discuss Sunflowers planted in previous Spring.
4. Identify Bitter Sweet. Determine how this plant may be saved from extermination.
5. Plant pots of Lilies of the Valley and Tulip bulbs in pots for early Spring blossoming. Insert pots in soil outdoors. Bring into classroom in late Winter.
6. Request gifts of Gladiolus corms from people who have more of these corms than they wish to keep. Place in box of sand or hang in cool place until Spring.
7. Identify six garden flowers in the Autumn. Look especially for flowers among those listed for Autumn, Grades I-III, Appendix.
8. Identify two Autumn wild flowers. Look especially for flowers among those listed for Autumn, Grades II-III, Appendix.

II. INSECTS AND SPIDERS

A. Problems and Experiences

1. To extend identification of insects.
2. To discriminate between the insect and the spider. (Insects six legs arranged in three pairs; a body of three parts. Spiders four pairs of legs and bodies divided into two parts instead of in three as in insects.)
3. To learn some distinguishing differences between the butterfly and the moth.
4. To study the life story of the grasshopper.

B. Suggested Activities

1. Identify fly, lightning bug, ladybug, bee, grasshopper, cricket, other common insects.
2. Find principal differences between insects and spiders.
3. Prove that moths and butterflies are insects.
4. List some distinguishing differences between the butterfly and the moth (Butterflies hatch from the chrysalis, moths from the cocoon; the butterfly usually flies by day, the moth at night). Look for moths at night near street lamps or in other lighted places.
5. Make school journeys in which various insects are observed and cocoons and chrysalises are collected.
6. Note butterflies and moths that closely resemble some of those hatched in classroom in Grades I-II.
7. Pupils examine pictures of Cecropia Moth and cocoon.
8. Pupils try to find Cecropia cocoons. (The cocoon of the Cecropia Moth is large and is quite noticeable on orchard and shade trees after the leaves have fallen off.)
9. Gather some of these and bring to classroom for Winter and Spring observation.
10. Make drawing of an insect and of a spider. Indicate general differences.
11. Note strong hind legs of grasshopper. Decide how he uses his hind legs when he meets an enemy. (Uses hind legs for escape and for kicking.) Discuss strength with which a grasshopper can kick in comparison with his size.
12. Place several grasshoppers in an insect cage as soon as school opens. Be sure that some of the grasshoppers are females. (Easily distinguished by ovipositor.)
13. Note well drilling instrument with which female grasshopper digs a hole in the earth in which to deposit her eggs. Provide proper food. Do not disturb soil as this may destroy any eggs that may have been laid.
14. How do the eyes of insects help them to escape their enemies?

III. CLOUDS, RAIN

A. Problems and Experiences

1. To find how clouds are formed.
2. To find when clouds furnish rain.

B. Suggested Activities

1. Place pans of water on stove and note that the water "boils away."
2. Place pans of water in open air. Note what happens to water. Decide in what form water has gone off in air (vapor).
3. Heat water in teakettle until steam pours from spout. Discriminate between the vapor and the steam as they come from spout. (Steam is water vapor which is partly condensed, turned into water.)
4. Illustrate precipitation by holding pan or plate over steam or cloud thus made. Experiment

with hot pan and cold pan. Note in which case precipitation takes place the more profusely.
5. Note formation of drops of water on outside of pitcher of cold water. Explain this. Decide what takes the place of the cold pitcher when dew is formed?
6. Discuss reason for blackness of rainclouds. (Hold much partially condensed water, smoke and other materials that rise to this height in the air.)
7. Compare color of storm clouds with color of deep, perhaps dirty, water.
8. Discuss the value of rain.
9. Determine why rain cleans the atmosphere.
10. Write composite paragraph explaining how clouds are formed from vapor that ascends from water on the earth's surface and that rain falls when the air becomes cold and condenses this vapor.

IV. FISH

A. Problems and Experiences
1. To find two or three kinds of fish commonly found in streams in or near community.
2. To identify the Bullhead.
3. To consider parental care among Bullheads.

B. Suggested Activities
1. List at least two fish commonly found in bodies of water in neighborhood.
2. List some common foods of these fish.
3. Discuss ways in which small fish escape the larger ones who seek them as food.
4. Learn story of parental care among Bullheads.
5. Discuss advantages of young fish whose mothers or both parents take care of them.

V. TURTLES

A. Problems and Experiences
1. To establish and care for a turtle aquarium.
2. To note hibernation of turtles.

B. Suggested Activities
1. Establish a turtle aquarium early in the Autumn. (Be sure a harmless turtle is chosen. Some breeds of turtles are very defensive.) A tub may be used. A small quantity of earth should be placed in the bottom and the tub partially filled with water. A rock or some solid object should project above the water in order to give the turtle opportunity to climb out of the water when he desires. Keep aquarium in cool place. Name turtle. (Gerald Craig, Tentative Course of Study in Elementary Science, Grades I and II, p. 43.)
2. Note effort of turtle to hibernate. Add enough earth to aquarium so that turtle may completely cover itself. (Animals that naturally hibernate do not always hibernate when placed in an artificial situation as in a schoolroom.)
3. Keep diary of important or interesting activities of turtle on blackboard or chart. Make picture of turtle.

VI. TREES, BUSHES, VINES

A. Problems and Experiences
1. To find how trees help man.
2. To determine how forest fires may be prevented.
3. To learn how trees propagate.
4. To compare Autumn appearance of trees, bushes and vines with their appearance in the Spring and Summer.

B. Suggested Activities
1. Reports of statements of grandfathers and others as to changes in forest areas within their memories.
2. Find at least one timber tree in neighborhood of a kind out of which lumber is made.
3. List some articles made of the lumber of this particular tree.
4. Discuss ways in which people may prevent forest fires.
5. Discuss damage caused by forest fires to animal and vegetable life.
6. Discuss ways in which trees propagate. (Nuts, seeds, shoots, cuttings).
7. Each pupil plant nuts of species of trees that flourish in neighborhood, in home yard, or other place where the tree may remain permanently. (Nut trees are difficult to transplant successfully.)
8. Protect each nut from squirrels and other dangers with wire netting or in other way that will permit air and moisture to get to seed.
9. Find how long before these nuts may be expected to send out roots and leaves.
10. Find the Forsythia in Autumn dress.
11. Find and examine Ground Pine.
12. Discuss results if quantities of Ground Pine are pulled up.
13. Identify three trees as they appear in the Autumn. Look especially for trees among those listed for Grades II-III, Appendix.
14. Identify three fruit trees in the Autumn. Look particularly for Peach, Apple and Cherry trees.
15. Correlate unit with Autumn Arbor Day Program.

VII. SEASONS

A. Problems and Experiences
1. To note the fact that the sun moves farther away from the zenith as Winter approaches.
2. To note general effect on weather in community as sun moves farther from zenith.
3. To learn names of months in Autumn season.

B. Suggested Activities
1. Experiment with candle or other light so that the fact is brought out that greater heat is felt when heated body is directly over the hand than when it strikes the hand obliquely. Apply to heat at noon.
2. Pupils note that sun is not exactly overhead at noon. Determine direction of sun from zenith at noon.
3. Trace with hand a pathway across the sky immediately above the head.

4. Choose a tree, a chimney or other object a short distance away and with hand draw pathway across the sky through the zenith of these objects. Repeat with objects farther away; still farther away.
5. Decide which pathways are the longest: those that pass directly overhead or those nearer the horizon.
6. Discuss relation of length of sun's pathway across the sky to the length of the day.
7. Indicate with hand course of sun across the sky once each week until the fact of movement away from the zenith is well grounded.
8. Note that pathway of sun across the sky becomes shorter as it moves downward from the zenith.
9. Set up rod in school grounds in such location that the rays of the sun may strike it at all times during the day. Note direction in which shadow falls in the morning and in which it falls in the afternoon; changing length of shadows at different periods of the day. Discuss reason for these changes.
10. Once each week at same hour of day mark end of shadow cast by rod with wooden sticks driven into the ground or in other manner.
11. Note changes in length of shadow and in direction toward which it falls as Winter approaches. Discuss meaning of these changes in relation to positions of earth and sun.
12. Pupils make pictures typical of Autumn and including the sun. Indicate by length and direction of shadow whether picture is a morning scene or an afternoon scene, assuming that the right hand side of the picture is East, the left side West, the bottom South, and the top North.
13. Once each month at same hour, pupils make pictures of Autumn scenes illustrating position of sun at that time in relation to the horizon and zenith.
14. Learn names of Autumn months.

VIII. Time

A. Problems and Experiences

1. To learn table of time.
2. To learn to tell time in minutes.

B. Suggested Activities

1. Pupils master following:

   Number seconds in minute; number minutes in hour; number hours in day; number days in week; number days in month; number days in year; number weeks in year. Telling of time on clock up to minutes, as 9:47; 2:53. Names of seasons and names of months in each season.

IX. Wind

A. Problems and Experiences

1. To learn how wind helps man.
2. To continue to note relation of direction of wind to weather.

B. Suggested Activities

1. Review material respecting winds in Grades I-II.
2. Make weather vane of paper, pin and stick or other materials. Note action of weather vane when held in wind.
3. During October, February, and last complete month of school year keep the following record on the blackboard or a sheet of cardboard for morning and afternoon. Column 1, date; column 2, direction from which wind is blowing; column 3, outdoor temperature; column 4, general description of weather.
4. Make a picture illustrating a windy day during each one of the above months.
5. Pupils constantly note relation of direction of wind to temperature and general weather conditions.
6. Discuss ways in which wind helps men, as the rotation of windmills, sailing of boats, movement of airplanes and dirigibles.

X. Birds

A. Problems and Experiences

1. To determine reasons for migration of birds.
2. To extend indentification of birds.

B. Suggested Activities

1. Discuss reasons for migration of birds.
2. Note direction in which flocks of birds are flying.
3. Identify five birds observed in community in Autumn. Look particularly for birds among those listed for Grades I-III, Appendix.
4. Note Autumn foods of birds identified.
5. Try to find abandoned nests of at least two species of birds.
6. Pupils who have seen a Ruffed Grouse, State bird, report experience. Tell where the Ruffed Grouse lays its eggs.

XI. Rocks, Soils

A. Problems and Experiences

1. To consider effect of rain upon rocks and soils.

B. Suggested Activities

1. After a heavy rain note changes in surface of soils; upon position of stones; upon rocks.

Helps For The Teacher In Evaluating Progress

1. Are your pupils able to identify the common Autumn fruits and vegetables; the Sunflower and the Bitter Sweet; the number of flowers suggested for identification?

2. Have pupils been interested in the improvement of their home flower gardens? Do they know how clouds are formed? Why it rains?

3. Are your pupils interested in the conservation of trees and forests?

4. Have your pupils made satisfactory progress in learning to tell time?

5. Have you any proof that learning to tell time has stimulated punctuality, in the home and school affairs of the class?

6. How many pupils became so interested in the school turtle that they made a point of observing the turtle in his native haunts?

7. Has the study of science added as much as it should to the pupil's desire to observe and find out things for himself?

8. Has there been as high a type of cooperation between the teacher and the class as is necessary for earnest and happy work on the part of both teacher and pupil.

9. Organize a matching test covering some of the points in the Autumn work that you feel should be thoroughly mastered.

NOTE: The following is an example of a matching test:

Directions to pupil: Place number in front of statement in right hand column corresponding to the number in front of statement in left hand column so that all statements in left hand column are correctly completed.

1.	Most birds migrate toward the south—	in the Winter.
2.	The bear hibernates—	from a cocoon.
3.	The Monarch Butterfly hatches—	in the Autumn.
4.	The Cecropia Moth hatches—	in the Spring.

WINTER

I. SEASONS

- A. Problems and Experiences
  1. To note the shortest day of the year.
  2. To note that following shortest day in the year the sun moves back toward zenith.
  3. To note relation of this movement to length of day; to temperature.
  4. To learn names of months in Winter season.
- B. Suggested Activities
  1. Continue observation at same time of day as in Autumn, of shadow cast by rod in school grounds; of movement of sun from the zenith; of direction in which shadow falls in the morning and in the afternoon; of time of day when shadow is shortest; longest.
  2. Note shortest day in the year.
  3. Make special mark to indicate length of shadow on shortest day of year.
  4. Note lengthening of days as sun moves back toward zenith.
     Explain this in terms of length of sun's pathway across the sky.
  5. Note that weather grows warmer as sun moves nearer to zenith. Give reasons for this.
  6. Note changes in length of shadow and direction in which it falls as Spring approaches.
  7. Decide toward which direction the sun is moving as it approaches zenith, North or South.
  8. Make weather chart for February similar to that made for October.
  9. Once each month, at same hour, pupils make pictures typical of Winter, illustrating position of sun at that time with respect to the horizon and zenith as in Autumn.
  10. Children tell stories respecting Winter weather in the Southern part of the United States or North America in general. Some of the children or their parents or acquaintances are almost certain to have lived or visited in the Southern States or in countries in the Southern part of North America.
  11. Note whether as Spring approaches the pathway of sun across the sky becomes longer or shorter.
  12. Learn names of winter months.

II. PLANTS, FLOWERS

- A. Problems and Experiences
  1. To extend identification of plants and flowers.
  2. To determine how to have blooming plants in classroom or home during Winter.
- B. Suggested Activities
  1. Visit greenhouse or florist in community.
  2. Identify four house or greenhouse plants. Look especially for plants and flowers included among those listed for Winter, Grades I-III, Appendix.
  3. Install in classroom one or two common household plants, if they can be kept from freezing.
  4. Learn how to care for these plants.
  5. Pupils install household plants in their homes if they can keep them from freezing.
  6. Report progress of home plants once each week.
  7. If plants do not thrive consult florist or someone who is successful in raising Winter plants as to probable reason for the situation.
  8. Take steps to improve the growth of affected plants.

III. INSECTS

- A. Problems and Experiences
  1. To continue observation of events in grasshopper cage.
  2. To learn why few insects are seen in the Winter.
  3. To continue observation of moth and butterfly pupae.
- B. Suggested Activities
  1. Note behavior of grasshoppers in cage.
  2. Discuss reasons for absence of insects in the Winter.
  3. Watch for the emergence of moths and butterflies from pupae in classroom.
  4. Decide whether or not a Cecropia Moth emerges from the cocoons that have been gathered. (Gerald Craig, Tentative Course of Study in Elementary Science, Grades I and II, p. 88)

IV. BIRDS

- A. Problems and Experiences
  1. To determine difficulties of Winter birds in obtaining food.
  2. To find where Winter birds in neighborhood roost.
  3. To extend identification of birds.
- B. Suggested Activities
  1. Make trips to observe Winter birds in neighborhood; note birds indentified in Autumn that remain in community during Winter.
  2. Find tracks of birds in snow; draw such tracks on paper.
  3. Learn to identify tracks of at least one species of bird.
  4. Discuss difficulties of Winter birds in obtaining foods; in securing sheltered sleeping quarters.
  5. Make food tables or window counters or both; provide food that is suitable for birds that it is intended to feed.
  6. Observe birds that eat at these tables or counters.

7. Pupils set up bird tables and counters at their homes.
8. Make sandtable scene showing in typical situations Winter birds, cut from paper or made in other way, that are common to neighborhood.
9. Pupils write a story about the difficulties of Winter birds.
10. Class organize itself into a Junior Audubon Club with the object of protecting and caring for helpful birds. (Junior National Audubon Society, 1974 Broadway, New York City)

V. TREES, BUSHES, VINES

A. Problems and Experiences
  1. To learn how trees, bushes and vines and their seeds live through the Winter.
  2. To continue consideration of prevention of forest fires.
  3. To extend identification of trees and vines.
  4. To identify the State tree (Hemlock.)

B. Suggested Activities
  1. Discuss ways in which trees, bushes and vines and their seeds live through the Winter.
  2. Identify three trees exclusive of fruit trees as they appear in the Winter. Look especially for trees among those listed for Grades II-III, Appendix.
  3. Identify three fruit trees in Winter dress. Look especially for Peach, Apple and Cherry trees.
  4. Identify the Forsythia in Winter dress.
  5. Identify Poison Ivy vine if there is any in the neighborhood.
  6. Discuss how forest fires affect the lives of hibernating and other animals; causes for such fires in the Winter.
  7. Determine why the part of the nut or seed from which the tree grows is not injured through lying on the ground during the Winter.
  8. Make a picture of the Hemlock tree.

VI. TRANSPORTATION

A. Problems and Experiences
  1. To learn the main points in the railroad locomotive.

B. Suggested Activities
  1. Organize main points in the locomotive; fuel used, how steam is formed, how this steam makes the wheels go around.
  2. Pupils draw or collect pictures of locomotive.
  3. Pupils list things they wish to know about the railroad locomotive.
  4. Ask railroad engineer or other informed person to answer these questions and others that may be raised.
     Desirable: Slides—The Historical Development of the Locomotive. See Catalog 28, p. 61, Keystone View Company, Meadville, Pennsylvania.

VII. HOUSEHOLD PETS, DOMESTIC ANIMALS, POULTRY

A. Problems and Experiences
  1. To learn how to eradicate insects that annoy our pet animals, domestic animals, and poultry.

B. Suggested Activities
  1. List causes for discomfort and illness on the part of household pets as improper foods, insufficient water, sleeping place too cold, fleas and other insects.
  2. Consider proper foods for dog, cat, fish kept in bowl. (Gerald Craig, Tentative Course of Study in Elementary Science for Grades III and IV, p. 56; Lessons for Teaching Humane Education, Nature, American Society for the Prevention of Cruelty to Animals).
  3. Discuss effect of insect pests on birds and on sheep.
  4. Find out from druggist or other person acquainted with such matters, how to kill lice on pet birds and fowls, fleas on dogs, and insect pests on sheep.

VIII. ANIMALS

A. Problems and Experiences
  1. To study some wild animals that live in other parts of the United States; in other parts of the world.

B. Suggested Activities
  1. Find pictures illustrating the habits of the opossum; of the prairie dog.
  2. Consider life history of opossum.

NOTE: In Nature Magazine, August 1930, American Nature Association, Washington, D. C. Carl G. Hartman in article, The Baby Opossum, says that eighteen newly born opossum babies may rest secure in a teaspoon and that two hundred and seventy of these babies weigh one ounce.

  3. Discuss common animals exhibited in circus or menagerie, as bear, elephant, camel, lion, tiger, giraffe, hippopotamus.
  4. Read or tell stories respecting some of these animals.
  5. Class and teacher working together make a list of four or five good wild animal stories to be found in the school library that are within the reading abilities of the group. Make similar list from books and magazines in other libraries in community, if there are any such.
     Desirable: Stereographs of wild animals, Keystone View Company, Meadville, Pennsylvania.

IX. TURTLES

A. Problems and Experiences
  1. To continue observation and care of turtle aquarium.

B. Suggested Activities
  1. If turtle has hibernated be careful not to disturb him. If he has not hibernated, he may do this if he is provided with additional soil.
  2. Continue diary of turtle.

X. FOODS

A. Problems and Experiences
  1. To find sources from which foods are obtained for Winter use.

- B. Suggested Activities
    1. List fresh fruits and vegetables that may be obtained in the Winter; that may be obtained at this season in cans or other preserved forms.
    2. List meats commonly used in homes of pupils.
    3. Visit butcher market; note carcasses of meat; find means through which meat is kept usable for long periods.

XI. SNOW, HAIL, FROST, ICE

- A. Problems and Experiences
    1. To find how snow and ice are formed.
    2. To note that water expands when it freezes.
    3. To discover some results of the expansion of ice.
- B. Suggested Activities
    1. Review how rain forms.
    2. On very cold day pour water slowly from a fine sprinkling can from second or third floor window. Note frozen drops of water. Apply to formation of hail.
    3. On very cold day boil water in teakettle until vapor pours from spout. Quickly carry to freezing air. Note that flakes form from vapor. Apply to the formation of snow.
    4. Decide why frost forms on the inside of window panes.
    5. Fill a strong glass jar about two-thirds full of water. Draw line on outside of jar at top of water. Place jar where water will freeze. Note expansion.
    6. Note what happens to the pasteboard stopper when a bottle of cream freezes.
    7. Determine why cement sidewalks sometimes break when they are frozen.
    8. Note what happens to rocks when they freeze.
    9. Discuss relation of freezing of rocks to the formation of soils.

XII. THERMOMETER

- A. Problems and Experiences
    1. To discover the principles of the thermometer.
- B. Suggested Activities
    1. Review expansion of water when frozen.
    2. Apply this principle to mercury.
    3. Place thermometer in shadow and note temperature; in sun and note temperature.
    4. Each day for a week read thermometer in classroom and outdoors in shadow and in sunshine. Note differences.
    5. Discuss indoor temperature at which pupils in the class are most comfortable; outdoor temperature.
    6. Continue reading of thermometer indoors and outdoors at least once each week for remainder of year.

XIII. STARS

- A. Problems and Experiences
    1. To learn the meaning of shooting stars.
    2. To find the North Star and the Pleides.
- B. Suggested Activities
    1. Find Big Dipper. Follow line of two stars in front of bowl to North Star.
    2. Decide why the North Star is called by this name.
    3. Discuss meaning of shooting stars.
    4. Pupils watch for such stars.
    5. Read or tell stories of famous shooting stars. (See Encyclopedias)
    6. Locate Pleides.
    7. Read or tell myth respecting this constellation.

XIV. TIME

- A. Problems and Experiences
    1. To add seconds to time-telling.
    2. To learn the value of the stop-watch.
- B. Suggested Activities
    1. Each pupil thoroughly master time-telling in minute periods.
    2. Learn how to tell time in seconds.
    3. Examine stop watch if one is available and find how it works.
    4. Determine values of stop watch.

XV. FUEL

- A. Problems and Experiences
    1. To determine common fuels used in homes of pupils for heating and cooking.
- B. Suggested Activities
    1. List common fuels used in homes of pupils for heating and cooking.
    2. Find sources from which each fuel is obtained, for example, petroleum from pockets of petroleum below surface of the earth, coal from coal veins, wood from trees.

XVI. SCIENCE IN THE HOME

- A. Problems and Experiences
    1. To learn why the clock is wound; why mechanical toys go.
- B. Suggested Activities
    1. Watch winding of clock.
    2. Observe, if possible, tightening of spring in clock during winding.
    3. Discuss meaning of statement that clock or watch "has run down"; how this affects the usefulness of the timepiece.
    4. Observe what happens when a mechanical toy is wound; when it runs down.

XVII. BUILDING MATERIALS

- A. Problems and Experiences
    1. To find most common building materials used in neighborhood.
    2. To learn the composition of these materials as wood, stone, brick, and manufactured materials.
- B. Suggested Activities
    1. Collect samples of building materials used in neighborhood; label each sample.
    2. Determine types of building material most commonly used in community, probable reasons for this.
    3. Make trips to dealers in building materials if conveniently near to secure additional information that may be desired.

XVIII. Weight

A. Problems and Experiences

1. To learn that weight is not always indicated by size.
2. To learn how to weigh objects on a scale.

B. Suggested Activities

1. Throw various articles into the air as feathers, light pieces of paper, pebbles or small stones. Note which articles come to the ground most rapidly. Discuss reasons for this.
2. Balance a light board on a support.
3. Place block or other object on one end of board and note result.
4. Adjust objects at ends of board so that board balances. Discuss meaning of this in relation to relative weights at each end of board.
5. Discuss weight in relation to size of piece of wood and size of piece of iron.
6. Name some articles that are bulky for their weight.

Helps For The Teacher In Evaluating Progress

1. How many pupils secured blossoming of plants in their homes for the Christmas season? At other times during the Winter?

2. Has your class established food tables for birds?

3. Do your pupils know why the shadow of the pole is the shortest of the day at noon?

4. Organize an alternative test covering the most important points studied during the Winter.

Note: An alternative test supplies several answers, all of which are incorrect except one. The pupil is directed to underline or check the correct answer as,

1. The baby opossum when born is:
   - a. as large as its mother.
   - b. as small as a kitten.
   - c. not much larger than a fly.

Teacher and pupils read each test. Pupil place on sheet of paper provided for the purpose number of test with letter that he considers correct, as 1-c.

SPRING AND SUMMER

I. Fossils

A. Problems and Experiences

1. To learn how rock layers are formed.
2. To learn how fossils are formed.

B. Suggested Activities

1. Place three or four inches of mud in pan or other receptacle. Cover with water. After water evaporates and mud hardens put in another layer of soil and cover with water. If different layers are of different kinds of soil or are colored the result will be more clear. When all is solid note layers. Small twigs, leaves or any light material may be included in layers to illustrate the formation of fossils.
2. Pupils bring to school examples of fossils that they may have in their homes.
3. Discuss origin of such fossils.

II. Trees, Bushes, Berries, Vines

A. Problems and Experiences

1. To note changes in trees, bushes, and vines in Spring.
2. To continue the study of ways in which trees propagate and develop.
3. To extend indentification of trees, bushes, and vines.
4. To note blossoms of common berry bushes blossoming in neighborhood.

B. Suggested Activities

1. Make school journeys in early Spring to find signs of growth in trees, bushes, and vines.
2. Note early flower buds as in Willow, Forsythia, Rhododendron. Place budding branches in water and observe development.
3. Review methods for propagating trees: planting of nut, twig, slip, young tree.
4. Pupils note in their yards and other places trees that are beginning to grow from seeds, or nuts, or from the roots of trees. If the location of such trees is desirable, plan for their protection.
5. If parents having such a tree in their yards do not wish to keep it perhaps they will give the tree to some pupil who would like it for his yard. Class help pupils accepting such a tree to learn how to transplant it. (U. S. Department of Agriculture, Miscellaneous Circular 28, The Forest, A Handbook for Teachers, p. 53) Such trees may also be planted in the school yard if they are likely to add to its appearance.
6. Plant branch of willow tree in pot or box or in open yard. Keep well watered. Note growth.
7. Identify three shade or forest trees as they appear in Spring and Summer dress. Look especially for trees among those listed for Grades II-III, Appendix.
8. Note flowers and seeds of Maple trees.
9. Locate Sugar Maple trees. (Hard Maple.)
10. Learn how maple sugar is made.
11. Pupils report fruit trees and berry bushes, and vines in blossom in home yards or nearby.
12. Identify three fruit trees as they appear in the Spring and Summer. Look especially for Peach, Apple and Cherry trees.
13. Identify Strawberry blossoms.
14. Note growth of nuts planted in Autumn.
15. Uncover carefully and find root or nut from which one young tree is growing. (Do not disturb growth and be sure to cover again carefully.)
16. Pupils care for young trees sprouting from these nuts during the Summer. Water if advisable. Build protection if trees are in danger of being trampled or otherwise injured.
17. Correlate unit with Spring Arbor Day Program.
18. Study the White Birch tree in connection with Mother's Day activities. Pupils who have White Birch trees in their yards report such trees. (The White Birch is commonly recognized as the Mother's tree. It is planted extensively throughout a large portion of the United States in connection with the Mother's Day school program.)

Desirable: Stereographs of trees. Send for lists to Keystone View Company, Meadville, Pennsylvania.

III. INSECTS AND SPIDERS
- A. Problems and Experiences
  1. To extend knowledge of spiders.
  2. To learn that there are harmless and harmful insects.
  3. To study the bee as a type of insect that is helpful to man.
  4. To learn that the Monarch Butterfly is a migrant.
  5. To find how the butterfly secures food.
- B. Suggested Activities
  1. Make trips to see spiders in their webs.
  2. Note if spiders observed seem to be of different kinds.
  3. Note location of webs, such as in buildings, bushes, trees, under stones, depressions in ground.
  4. Note spider's food as indicated in remains in webs or nearby.
  5. Observe spiders while spinning.
  6. Observe where the spinnerets are located. (Gerald Craig, Tentative Course of Study in Elementary Science for Grades I and II, p. 82)
  7. Learn name of at least one species of spider that is common in the neighborhood. Look particularly for grass spider.
  8. Determine why the fly is dangerous.
  9. Note rapidity with which flies increase.
  10. Place piece of meat in glass jar in open air. When blowflies have laid eggs on meat tie thin piece of cloth over top of jar. Watch transformation of eggs into larvae, pupae, and flies.
  11. Organize campaign for elimination of breeding places of flies.
  12. Discuss the mosquito as a dangerous insect.
  13. Find why mosquitoes are especially thick along a stream or marsh.
  14. Determine why even a drop of stagnant water may furnish a place for the breeding of mosquitoes.
  15. Place a jar or tub in the open air. Mosquitoes are likely to lay eggs. Note hatching of eggs into larvae, or wrigglers; transformation of wrigglers into pupae; metamorphosis of pupae into mosquitoes. (After larvae have hatched cover receptacle with netting so that mosquitoes may not fly into neighborhood. When mosquitoes begin to hatch pour some oil into tub or jar and douse netting in this.)
  16. Discuss methods for keeping flies and mosquitoes out of the house; how those that get in may be eliminated; how to keep flies and mosquitoes from multiplying. If mosquitoes breed in nearby patches of water treat some of these patches with oil.
  17. Discuss the bee as a type of insect that is helpful to man.
  18. Examine piece of honey comb and note characteristics.
  19. Discuss methods of the bee in collecting and storing honey.
  20. Discriminate between bumble bee and honey bee. (Gerald Craig, Tentative Course of Study in Elementary Science, Grades III and IV, p. 74)
  21. Make pictures in colored crayons of bees collecting honey and carrying it to the hive.
  22. Note whether the insects that the spider kills for food are generally harmful to man or helpful; for example, does the spider kill flies and mosquitoes.
  23. Each pupil choose a spider and his web for special observation. Pupils keep a diary for this spider. Find common name; note foods.
  24. Sum up results of observation and determine whether this particular spider is helpful or harmful to man.
  25. Make school journey in which pupils who have chosen spiders for study that are on or near to the school grounds show them to other members of the class.
  26. Pupils sum up results of their observation of spiders on a basis of their help to man.
  27. Find main points in the migration of the Monarch Butterfly.
  28. Learn story of migration of Monarch Butterfly.
  29. Observe a butterfly feeding upon nectar.
  30. When dead butterflies are found try to uncoil tongue.

  Desirable: Stereographs showing stages in metamorphosis of flies and mosquitoes. See Catalog 24, p. 11, Keystone View Company, Meadville, Pennsylvania.

IV. METAMORPHOSIS
- A. Problems and Experiences
  1. To observe the metamorphosis of the frog and toad.
- B. Suggested Activities
  1. Place in aquarium eggs of frogs or toads or install tadpoles if eggs cannot be obtained. (Gerald Craig, Tentative Course of Study in Elementary Science for Grades I and II, p. 45. Also in Craig's Tentative Course of Study in Elementary Science for Grades V and VI, p. 36)
  2. Note that the diet of the frog or toad differs from that of the diet of the tadpole. (The tadpole feeds on plant growths; the frog eats insects and worms. Pond water used in aquarium may produce the algae upon which the tadpole feeds.)
  3. Pupils make picture illustrating metamorphosis of frog or toad.
  4. Class choose pictures that give an attractive and correct history of important points in the metamorphosis of the frog or toad and exhibit as a series.
  5. Make school journeys to points where tadpoles, frogs, and toads may be observed in their native habitats, if such journeys can be arranged with safety.
  6. Note how frogs and toads breathe. A frog or toad will suffocate if its mouth is held open for any length of time. Why?

Desirable: Stereographs showing stages in development of frogs and toads. See Catalog 24, p. 12, Keystone View Company, Meadville, Pennsylvania.

V. TURTLES

A. Problems and Experiences

1. To continue observation and care of turtle aquarium.

B. Suggested Activities

1. Continue diary of turtle.
2. Summarize history of turtle kept in school room as indicated in diary.
3. Before close of school give turtle to pupil who will take good care of it or lend it to such pupil until opening of school, or carry to favorable spot and liberate.

VI. FISH

A. Problems and Experiences

1. To find some reasons why fish can swim.
2. To find why fish differ in the type of water or streams in which they live.

B. Suggested Activities

1. Pupils look for air bladder when fish is being cleaned. Bring to school. Determine use.
2. Identify the Sunfish and Brook Trout.
3. Determine why the Sunfish chooses to live in quiet streams; why the Trout is able to swim in swift streams.
4. Consider other fish from similar points of view.

VII. BIRDS

A. Problems and Experiences

1. To note the return of birds that went South in Autumn.
2. To extend identification of birds.
3. To determine what the class may do to attract beautiful and helpful birds to the neighborhood.
4. To learn the name of at least one bird that comes to community to nest only; of one that goes farther North than Pennsylvania before building a nest.

B. Suggested Activities

1. Each pupil keep chart of return of birds with name of bird and date when first seen.
2. Discuss reasons for return of birds to community.
3. Discuss relation of destruction of forests to bird life.
4. Discuss means through which the destruction of birds by cats may be prevented.
5. Discuss some of the things thoughtless boys and girls do that destroy the lives of helpful birds.
6. Locate in neighborhood natural places suitable for birds to drink and bathe.
7. If needed, provide artificial places for birds to drink and bathe.
8. Note birds identified in Autumn that nest in community.
9. Try particularly to find birds among those listed for Grades I-III, Appendix.
10. Discuss what class may do to encourage birds to come to the neighborhood.
11. Correlate study of unit with Bird Day Program.

VIII. FOODS

A. Problems and Experiences

1. To find sources for cane, beet, maple sugar.
2. To extend knowledge of fruits and vegetables grown in neighborhood in Spring.

B. Suggested Activities

1. Find how cane and beet sugar are obtained.
2. If there are sugar maple trees in the neighborhood observe running of sap in Spring.
3. Find how maple sugar is made.
4. List fresh foods that mature in neighborhood before close of school year; that are found in stores but not in neighborhood gardens. Discuss sources from which stores obtain such foods.

IX. HEREDITY

A. Problems and Experiences

1. To note that chickens hatch from eggs laid by the hen; that ducks hatch from eggs laid by the duck; that young Robins hatch from eggs of Robins; that this same principle holds with respect to all birds, animals, insects, flowers, trees, and organisms in general.

B. Suggested Activities

1. Discuss such questions as reason for using hen's eggs when we wish to hatch chickens; for planting Pansy seeds when we wish to have Pansy flowers.

X. SEASONS

A. Problems and Experiences

1. To note that the pathway of the sun across the sky continues to move nearer to the zenith in Spring and early Summer.
2. To note general effect upon weather in community as sun continues to move toward zenith.
3. To note relation of length of pathway of sun across the sky to length of day.
4. To learn names of Spring and Summer months.

B. Suggested Activities

1. Note first day of Spring months.
2. Continue to mark shadows of rod as in Autumn and Winter.
3. Note shortening of shadows and changes in direction in which they fall.
4. Note longest day in year.
5. Compare length and direction of shadow cast by stake on longest day of the year with length and direction of shadow cast at the same hour on the shortest day of the year.
6. Make weather chart for last month of school year as in Autumn and Winter.
7. Once each month at same hour of day pupils make pictures as in Autumn and Winter illustrating position of sun in relation to the horizon and zenith.
8. Learn names of Spring months; of Summer months that are coming.

9. Summarize facts learned respecting Seasons during the year.

XI. INSECTS

A. Problems and Experiences
1. To continue observation of events in grasshopper cage.
2. To discriminate between incomplete metamorphosis and complete metamorphosis.
3. To extend identification of moths and butterflies.

B. Suggested Activities
1. Watch for appearance of small grasshoppers if eggs have been laid in the cage.
2. Note grasshoppers in open in the Spring.
3. Note points of difference between hatching of butterfly and hatching of grasshopper.
4. Determine why the changes from the egg to the grasshopper is called incomplete metamorphosis and that of the butterfly, moth, frog and toad is called complete metamorphosis.
5. In the Spring and Summer try to find and observe Monarch Butterfly, Cecropia Moth, Promethea Moth, or three other butterflies and moths.
6. Pupils make drawings of butterflies and moths identified. Label each drawing.

XII. FARM

A. Problems and Experiences
1. To determine some contributions the farm makes to food and clothing.

B. Suggested Activities
1. List foods that would disappear from our tables if farms were to cease production.
2. Pupils report location of especially productive farms of which they know.
3. Class visit a modern farm if one is nearby. If this is not feasible, perhaps a few pupils may be able to do this and report their observations to the class.
4. List minimum requirements for a good farm, such as fertile soil, sufficient moisture, good seeds, adequate equipment, proper care.

XIII. WEEDS

A. Problems and Experiences
1. To find how to reduce weeds in neighborhood that interfere with the growth of desirable plants.

B. Suggested Activities
1. List some weeds that greatly interfere with the growth of lawns; with farm crops.
2. Pupils report unusually fine lawns in the community.
3. Pupils find how these fine lawns have been kept free of weeds.
4. Report farm fields observed that have few or no weeds.
5. Find out how fields clear of weeds are kept that way.
6. Discuss methods through which weeds in the neighborhood may be reduced.

XIV. FLOWERS

A. Problems and Experiences
1. To find relation of moisture to plant growth in general.
2. To extend experiences in the planting and growing of flowers.
3. To plan for conservation and protection of disappearing wild flowers.

B. Suggested Activities
1. Plant beans or other seeds in pots or boxes. Place so that all receive equal and plentiful sunshine.
2. Keep some pots or boxes unwatered; others slightly moist; others somewhat more moist; others very wet. Observe modifications in growth because of different degrees of moisture.
3. Seek examples in out of door plants that illustrate the principles discovered. Review results of experiments with sunshine as it relates to growth in Grade II.
4. Determine relation of sunlight and moisture to growth of most plants.
5. Pupils plant slips in pots or window boxes in classroom.
6. Pupils take plants growing from these slips to their homes at close of school year.
7. In March or April plant Petunia seeds and Snapdragon seeds in boxes or pots. When suitable size transplant to home and school gardens.
8. Pupils who do not have Gladiolus in their home gardens take to homes and plant Gladiolus corms received as gifts in Autumn.
9. Discuss propagation of Pansy. Decide why people usually purchase Pansy plants for planting.
10. Obtain surplus Pansy plants from homes for planting in yards of pupils who do not have such plants.
11. Establish pot or box of Pansy plants in schoolroom.
12. Discriminate between Climbing and Bush Roses.
13. Identify six garden flowers. Look especially for flowers among those listed for Spring and Summer, Grades I-III, Appendix.
14. Learn to identify four wild flowers. Look especially for four among those listed for Spring and Summer, Grades I-III, Appendix.
15. Each pupil make picture of at least one wild flower that he knows.
16. Identify one vine. Look particularly for the Honeysuckle.

Desirable: Stereographs of wild flowers. Keystone View Company, Meadville, Pennsylvania.

XV. WORMS

A. Problems and Experiences
1. To discriminate between a worm and larvae.
2. To make a special study of the earthworm.

B. Suggested Activities

1. Discuss most important difference between a worm and larvae. (A real worm always remains a worm; larvae change to pupae and then to insects)
2. Find earthworm holes in soil. Dig to bottom so as to find how far down the earthworm makes his home.
3. List some enemies of the earthworm.
4. Find out how the Robin locates the earthworm.
5. Note piles of earth on the surface of the ground that have passed through the earthworm.
6. Decide how these piles of earth help to keep the soil fertile.
7. Look for the egg band on the earthworm; perhaps egg capsules may be found under stones or in other places.
8. Place earthworms in case in classroom. Provide with food. (include lettuce or cabbage leaves) Note how it eats; how it moves itself about; how long it takes to cover itself with earth.

Helps For The Teacher In Evaluating Progress

1. How successful were you in the care of your turtle?

2. Have a satisfactory proportion of the nuts planted in the Autumn sprouted?

3. Do your pupils sense the relation of the position of the sun with respect to the zenith to the seasons?

4. Can the pupils in the class read the thermometer? Do they have a reasonable sense of the meaning of these readings?

5. Was the exhibition of fossils a satisfactory one?

6. Are the pupils in the class interested in the elimination of breeding places for flies and mosquitoes?

7. Do you feel that the pupils in the class have added to their sense of heredity?

8. Do the pupils in your class connect the length and direction of the shadows of the pole set up with the position of the sun?

9. Are your pupils interested in the conservation of wild flowers? Of forests? In the prevention of forest fires? In securing good flower and vegetable gardens in their home yards?

10. Are your pupils keeping their pet birds and animals clear of insect pests?

11. Test your pupils on the following true-false statements. Do not give more than eight or nine questions at one time.

1. Fresh cabbage cannot be obtained in the Winter.
2. The Paper White Narcissus will not blossom if planted in water and pebbles.
3. The grasshopper deposits her eggs in a hole which she digs in the ground.
4. Drops of water on the outside of a pitcher of cold water are formed from water that soaks through the pitcher.
5. The parent fish of young Bullheads swim away and leave the young fish to take care of themselves.
6. Turtles always hibernate in the Winter.
7. The Forsythia has a red flower.
8. Every person who visits a grove or forest should be sure that he has left no spark of fire behind him.
9. There are 375 days in a year.
10. A pound of feathers is heavier than a pound of iron.
11. Ice begins to form at the bottom of a stream.
12. The spider is an insect.
13. April 1 is the first day of Spring.
14. The Sugar Maple is a Soft Maple.
15. The metamorphosis of the grasshopper is incomplete.
16. The shadow cast by the same pole is shorter at noon in the Summer than it is at noon in the Winter.
17. It is hot in the Summer because the sun's rays fall almost directly upon the earth.
18. April is a Winter month.

12. Have they learned what you expected them to learn about beetles?

13. Do you insist upon proof whenever it is reasonable to demand it of your pupils in their statements respecting scientific problems?

14. In what ways do you think the habit of demanding proof may help these boys and girls to be good citizens?

15. What objections do you see to a school garden that is planted by the pupils and permitted to die during the summer?

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Appendix

BIRDS

GRADE	PERMANENT	MIGRANT	WINTER ONLY
I	Starling	Robin	
II	Hairy Woodpecker	Scarlet Tanager English Sparrow Crow	
III	Goldfinch White-breasted Nuthatch	House Wren Meadowlark Bluebird Purple Grackle Bronze Grackle Baltimore Oriole	
IV	Song Sparrow Cardinal	Catbird Red-headed Woodpecker Barn Swallow Chipping Sparrow Field Sparrow Cowbird Phoebe	Tree Sparrow Slate Colored Junco Golden Crowned Kinglet
V	Blackcapped chickadee Screech Owl Great Horned Owl	Ovenbird Redstart Ruby-Throated Humming Bird Brown Thrasher Cerulean Warbler Northern Flicker	Tree Sparrow Slate Colored Junco Golden Crowned Kinglet
VI	Game Birds: Bob White (Quail, Partridge) Ring-necked Pheasant Ruffed Grouse		

FOREST AND ORNAMENT TREES

GRADE	SPECIES OF TREE
I	Pussy Willow Hickory Spruce
II	Oak Weeping Willow Hemlock Arbor Vitae (Cedar) Cottonwood Hawthorn
III	Sugar Maple (hard) Silver Maple (soft) Birch Black Walnut Tulip Tree Locust Pawpaw Box Tree
IV	Stag Horn Sumach Smooth Sumach Poison Sumach Horse Chestnut Elm Butternut Hornbeam (Ironwood) Black Gum
V	Red Oak White Oak Witch Hazel Ash Ailanthus American Holly Buttonwood Sassafras Catalpa
VI	Ten Trees

FLOWERS

GRADE	SEASON	GARDEN FLOWERS	HOUSE OR GREENHOUSE PLANTS
I	Autumn	Marigold Nasturtium	
	Winter		Poinsettia Geranium
	Spring and Summer	Bachelor's Button Forget-me-not Easter Lily Crocus	
II	Autumn	Mignonette Phlox Sunflower	
	Winter		Carnation Rose Rubber Plant
	Spring and Summer	Garden Pinks Lily of the Valley Pansy Tulip Snapdragon Portulaca	
III	Autumn	Poppy Gladiolus Cosmos	
	Winter		Chrysanthemum Begonia Azalea Fuschsia
	Spring and Summer	Sweet William Columbine Honeysuckle Bleeding Heart Iris Lilac	
IV	Autumn	Salvia Canna Morning Glory Aster Sweet Alyssum	
	Winter		Maiden Hair Fern Boton Fern Fan Palms Gloxinia
	Spring and Summer	Peony Snowball Wisteria Verbena Sweet Peas	
V	Autumn	Scabiosa Zinnia Dahlia Chinese Lantern African Golden Daisy Phlox—annual	
	Winter		Orchid Calla Lily Hydrangea Caladium
	Spring and Summer	Rose Clematis Delphinium Petunia Tuberose Hollyhocks	
VI	Autumn	Fourteen Garden Flowers	
	Winter		Eight House or Greenhouse Plants
	Spring and Summer	Fourteen Garden Flowers	

WILD FLOWERS

GRADE	AUTUMN	SPRING AND SUMMER
I		Dandelion *Arbutus Buttercup
II	Goldenrod Ox-eye Daisy (White Daisy) Red Clover Touch-me-not	Violet Bluet Spring Beauty Crane's Bill Milkweed *Marsh Marigold
III	Black-eyed Susan (Yellow Daisy) Thistle Evening Primrose	*Bloodroot *Dogwood *Dog's Tooth Violet *Lady's Slipper Wild Rose Bouncing Bet Yellow Pond Lily Toothwort Ground Ivy *Dwarf Cornel *Coral Root Moth Mullein
IV	Queen Anne's Lace Butter and Eggs Yarrow *Ladies Tresses	Indian Pipe *Dutchman's Breeches Squirrel Corn *Trillium Wild Blue Phlox Skunk Cabbage *Bluebell Devil's Paint-Brush False Solomon's Seal Early Saxifrage *Columbine Self Heal *Showy Orchid *Dragon's Mouth
V	*Closed Gentian *Fringed Gentian Wild Aster Witch Hazel	Water Lily May Apple Jack-in-the-Pulpit *Mountain Laurel *Turk's Cap Lily Wild Ginger *Hepatica Rue Anemone (Wild Flower) Wild Strawberry Arrowhead Boneset *Rhododendron Cattail *Cardinal Flower *Pogonia
VI	Four Wild Flowers	Eight Wild Flowers

*Wild Flowers that should be protected.